E & A
INSECT. ENT.
LIBRARY
23 AUG 1937
STATE

Bulletin 396 May, 1937

CONNECTICUT STATE ENTOMOLOGIST

THIRTY-SIXTH REPORT

1936

W. E. BRITTON, PH.D.
State Entomologist

Connecticut
Agricultural Experiment Station
New Haven

Bulletin 396 May, 1937

CONNECTICUT STATE ENTOMOLOGIST

THIRTY-SIXTH REPORT

1936

W. E. BRITTON, PH.D.
State Entomologist

Connecticut
Agricultural Experiment Station
New Haven

CONNECTICUT AGRICULTURAL EXPERIMENT STATION

BOARD OF CONTROL

His Excellency, Governor Wilbur L. Cross, ex-officio, President
Elijah Rogers, Vice-President ..... Southington
William L. Slate, Director and Treasurer ..... New Haven
Edward C. Schneider, Secretary ..... Middletown
Joseph W. Alsop ..... Avon
Charles G. Morris ..... Newtown
Albert B. Plant ..... Branford
Olcott F. King ..... South Windsor

STAFF

Administration.

William L. Slate, B.Sc., *Director and Treasurer.*
Miss L. M. Brautlecht, *Bookkeeper and Librarian.*
Miss Katherine M. Palmer, B.Litt., *Editor.*
G. E. Graham, *In Charge of Buildings and Grounds.*

Analytical Chemistry.

E. M. Bailey, Ph.D., *Chemist in Charge.*
C. E. Shepard, Owen L. Nolan, Harry J. Fisher, Ph.D., W. T. Mathis, David C. Walden, B.S. — *Assistant Chemists.*
Miss Janetha Shepard, *General Assistant.*
Chas. W. Soderberg, *Laboratory Assistant.*
V. L. Churchill, *Sampling Agent.*
Mrs. A. B. Vosburgh, *Secretary.*

Biochemistry.

H. B. Vickery, Ph.D., *Biochemist in Charge.*
George W. Pucher, Ph.D., *Assistant Biochemist.*

Botany.

G. P. Clinton, Sc.D., *Botanist in Charge.*
E. M. Stoddard, B.S., *Pomologist.*
Miss Florence A. McCormick, Ph.D., *Pathologist.*
A. A. Dunlap, Ph.D., *Assistant Mycologist.*
A. D. McDonnell, *General Assistant.*
Mrs. W. W. Kelsey, *Secretary.*

Entomology.

W. E. Britton, Ph.D., D.Sc., *Entomologist in Charge, State Entomologist.*
B. H. Walden, B.Agr., M. P. Zappe, B.S., Philip Garman, Ph.D., Roger B. Friend, Ph.D., Neely Turner, M.A. — *Assistant Entomologists.*
John T. Ashworth, *Deputy in Charge of Gypsy Moth Control.*
R. C. Botsford, *Deputy in Charge of Mosquito Elimination.*
J. P. Johnson, B.S., *Deputy in Charge of Japanese Beetle Control.*
Miss Helen A. Hulse, Miss Betty Scoville — *Secretaries.*

Forestry.

Walter O. Filley, *Forester in Charge.*
H. W. Hicock, M.F., *Assistant Forester.*
J. E. Riley, Jr., M.F., *In Charge of Blister Rust Control.*
Miss Pauline A. Merchant, *Secretary.*

Plant Breeding.

Donald F. Jones, Sc.D., *Geneticist in Charge.*
W. Ralph Singleton, Sc.D., Lawrence C. Curtis, B.S., — *Assistant Geneticists.*

Soils.

M. F. Morgan, Ph.D., *Agronomist in Charge.*
H. G. M. Jacobson, M.S., Herbert A. Lunt, Ph.D., — *Assistant Agronomists.*
Dwight B. Downs, *General Assistant.*
Miss Geraldine Everett, *Secretary.*

Tobacco Substation at Windsor.

Paul J. Anderson, Ph.D., *Pathologist in Charge.*
T. R. Swanback, M.S., *Agronomist.*
O. E. Street, Ph.D., *Plant Physiologist.*
C. E. Swanson, *Laboratory Technician.*
Miss Dorothy Lenard, *Secretary.*

Printing by The Peiper Press, Inc., Wallingford, Conn.

CONTENTS

	Page
Entomological Features of 1936	293
Insect Record For 1936	294
Fruit Insects	294
Vegetable Insects	296
Shade and Forest Tree Insects	297
Insects of Ornamental Shrubs and Vines	303
Insects of Flowers and Greenhouse Plants	304
Insects Infesting Stored Food Products	305
Household Insects	306
Insects Infesting Timbers and Wood Products	307
Insects of Soil and Lawn	307
Insects Annoying Man and Domestic Animals	308
Spiders	308
Beneficial Insects	308
Miscellaneous	309
Conference of Connecticut Entomologists	310
Insect Collection: Additions and Statistics	311
Department Library: Additions and Statistics	312
Inspection of Nurseries, 1936	314
Number and Size of Nurseries	314
Connecticut Nursery Firms Certified in 1936	315
Other Kinds of Certificates Issued	322
Inspection of Imported Nursery Stock	322
Results of Inspection	323
Inspection of Apiaries, 1936	324
Statistics of Inspection	325
Summary	329
Financial Statement	329
Registration of Bees	330
Report on Control of the Gypsy Moth, 1936	330
New Equipment	331
Control Operations	331
Work Performed by State Men	331
Work Performed by CCC Men	332
WPA Work Performed	332
Resettlement Administration Project	332
Quarantines	332
Statistics of Infestations, 1935-1936	333
Summary of Statistics	337
Financial Statement	338
Scouting for the Brown-Tail Moth	339
Appropriation	339
Control of the European Corn Borer, 1936	340
Compulsory Clean-up	340
Date of Planting Experiment	341
Insecticide Investigations	341
A Second Trial of Trichogramma Parasites	343
European Corn Borer in Potatoes	345
Japanese Beetle Work in Connecticut, 1936	346
Scouting	346
Trapping	347
Inspection and Certification	348
Grub Digging	349
General Japanese Beetle Survey	349
Notes on Hymenopterous Parasites of Elm Insects in Connecticut	351

Page

THE SATIN MOTH ... 361
Life History and Habits ... 361
Description ... 362
Food Plants ... 363
Natural Enemies ... 363
Artificial Control ... 363
Quarantine Revoked ... 363
TESTS OF APPLE SPRAYS ... 364
FURTHER NOTES ON *Calomycterus setarius* ROELOFS ... 367
CONTROL OF LEAFHOPPERS ON DAHLIAS ... 370
OBSERVATIONS ON THE EUROPEAN RED MITE AND ITS CONTROL ... 372
Discussion of the Mite Predator Problem ... 374
WORK WITH ORIENTAL FRUIT MOTH PARASITES ... 378
FURTHER STUDIES IN CONTROL OF THE APPLE MAGGOT ... 378
NOTES ON CONTROL OF THE TENT CATERPILLAR IN ORCHARDS ... 379
NOTE ON FIELD AND LABORATORY CONTROL OF CANKER WORMS ... 381
REPORT ON PEACH SPRAYS ... 382
EXPERIMENTS WITH CONTROL OF THE ROSY APPLE APHID ... 383
STUDY OF SEVERAL NICOTINE PREPARATIONS AND WETTING AGENTS FOR INCREASING THEIR TOXICITY ... 385
THE HORNED SQUASH BUG, *Anasa armigera*, WITH A NOTE ON *Anasa repetita* ... 387
CONTROL OF THE STRIPED CUCUMBER BEETLE ... 391
OBSERVATIONS ON TERMITES AND TERMITE CONTROL ... 392
Survey of Termite Damage to Buildings ... 393
Effectiveness of Metal Termite Shields ... 394
Observations on Soil Treatments ... 395
PRESENT STATUS OF MOSQUITO CONTROL WORK IN CONNECTICUT ... 396
Resumé of Work Accomplished ... 397
MISCELLANEOUS INSECT NOTES ... 399
Outbreak of Say's Blister Beetle ... 399
The Greenhouse Leaf Tier ... 399
A Leaf Roller on Hickory ... 399
Elms Injured by Rose Chafer ... 399
Scarcity of the Fall Webworm ... 399
The Pepper Maggot in Connecticut ... 399
Damage by the Poplar Sawfly ... 400
Peach Foliage Eaten by a Flea Beetle ... 400
Peach Trees Injured by New York Weevil ... 400
The Elm Leaf Beetle ... 401
Prevalence of the Forest Tent Caterpillar ... 401
A New Mite on Box ... 402
Alders Stripped by a Sawfly ... 402
Damage by a New Blister Beetle ... 403
Strawberries Injured by *Diplotaxis atlantis* ... 403
House Timbers Injured by Anobiid Beetles ... 404
The Lime-Tree Looper ... 405
Prevalence of the Psychid Moth, *Fumea casta* ... 406
The Fall Canker Worm ... 406
Bird Mites in a Dwelling House ... 406
Damage by the Spring Canker Worm ... 407
Decrease of the Tent Caterpillar ... 409
A New Weevil Injuring Pine in Connecticut ... 410
FINANCIAL STATEMENT ... 412
PUBLICATIONS, 1936 ... 413
SUMMARY OF OFFICE AND INSPECTION WORK ... 414
ILLUSTRATIONS ... 415
INDEX ... *xi*

CONNECTICUT STATE ENTOMOLOGIST

THIRTY-SIXTH REPORT

1936

W. E. Britton

ENTOMOLOGICAL FEATURES OF 1936

The winter of 1935-36 was neither very severe nor extremely mild. There was a fair amount of snowfall and some steady cold weather but not such extremely low temperatures as in the two preceding winters. On the whole there was probably less alternate freezing and thawing than in most winters, and in general, plants came through in good shape. Peach buds were killed only in a few localities, and there was nearly a full crop of fruit for the first time since 1933.

The precipitation for January, March, April, June, September and October was considerably above the normal, but for February, May, July, August and November it was below the normal. The heaviest rainfall came in June and was more than three times the normal amount. The lightest rainfall was in November. That for both July and November was less than half the normal. The rainfall for the growing season, May to September, inclusive, was nearly four inches or 21 percent above the normal. However, it was not distributed in a normal manner and if a portion of the June precipitation could have fallen in July and August it would undoubtedly have proved a greater benefit to most crops.

Some of the more important entomological features of the season were the collection in Connecticut of the pepper maggot fly, *Zonosemata electa* Say; the unusual prevalence of the spring canker worm, *Paleacrita vernata* Peck; continued damage by the fall canker worm, *Alsophila pometaria* Harr.; continued abundance of the eastern tent caterpillar, *Malacosoma americana* Fabr.; increased prevalence of the forest tent caterpillar, *Malacosoma disstria* Hubn.; increase in abundance and destructiveness of the Japanese beetle, *Popillia japonica* Newm.; local outbreaks of the rosy apple aphid, *Anuraphis roseus* Baker, in apple orchards, and of the potato aphid, *Illinoia solanifolii* Ashm., in potato and tomato fields; a rather unusual damage to peach trees by a small green leaf beetle, *Chalcoides* (*Crepidodera*) *helxines* Linn., and by the New York weevil, *Ithycerus noveboracensis* Först.; prevalence of the European red mite, *Paratetranychus pilosus* C. & F.; damage to corn, potatoes and dahlias by the European corn borer, *Pyrausta nubilalis* Hubn.; discovery of a weevil, *Hylobius radicis* Buch., new to Connecticut, injuring Scotch pines; defoliation of an ornamental tree by a blister beetle, *Macrobasis torsa* Lec., first reported in the State in 1934; increase of the weevil from Japan, *Calomycterus setarius*

308
392
399

Roelofs; damage to lawns by the grubs of a native Scarabaeid beetle, *Ochrosidia villosa* Burm; and continued damage to buildings by termites, *Reticulitermes flavipes* Koll. Also the comparative scarcity of the fall webworm, *Hyphantria cunea* Dru., and the rose stem girdler, *Agrilus communis rubicola* Perrin.

Some of the more important entomological features of 1936 are given in greater detail in separate articles and notes printed elsewhere in this report. In the following list is presented an insect pest survey for 1936:

Insect Record for 1936

FRUIT INSECTS

Name	Locality, host, date and remarks.

Alsophila pometaria, fall canker worm. Common in southern and southwestern Connecticut where unsprayed fruit trees were partially or wholly defoliated. Eggs were abundant in March in some apple orchards in New Haven County. Many young caterpillars were killed by the pink spray, May 5 to 7.

Anuraphis roseus, rosy apple aphid. Very abundant in some localities in New Haven County in May and June, but the outbreak was not general. There was a decided increase between June 1 and 15, then migration took place. Newly hatched aphids on apple fruit buds were received from Foxon, Apr. 13.

Aphids (immature and dead). On plum, Westport, June 16; cast skins on plum, Middletown, Aug. 5; cast skins on apple, Kent, July 24; crushed, on cherry and apple, West Haven, July 7.

Aphis pomi, green apple aphid. Eggs numerous on buds, and some of them had hatched by Mar. 23; specimens on fruit buds received from Foxon, Apr. 13.

Aspidiotus perniciosus, San José scale. On currant, West Hartford, Sept. 22.

Cacoecia argyrospila, fruit tree leaf roller. Less prevalent than for several years in the orchards where it has occurred, probably due to spray applications.

Cacoecia rosaceana, oblique-banded leaf roller. Larva on leaf of Japanese plum, Hartford, May 11.

Camponotus herculeanus pennsylvanicus, black carpenter ant. Many workers from trunk of apple tree, New Haven, May 25.

Carpocapsa pomonella, codling moth. Present everywhere in moderate numbers.

Cecidomyia viticola, grape tube gall. Galls on grape leaf, Shelton, Sept. 8.

Chalcoides (*Crepidodera*) *helxines*, a small green leaf beetle. Adults injured peach orchards in Southington by feeding upon the leaves in May. Adjoining chokecherry hedges were heavily infested and probably were the source of the infestation.

Conotrachelus nenuphar, plum curculio. Beetles had emerged from hibernating quarters, May 19, and were finally more prevalent than in 1935. Not serious in sprayed orchards.

Datana ministra, yellow-necked caterpillar. Larvae on apple leaves, Hamden, Aug. 25; North Branford, Sept. 10.

Diplotaxis atlantis, a small Scarabaeid beetle. Adults devoured strawberry leaves, causing moderate injury to a 1.5 acre field, Foxon, May 11.

Empria ignota, green strawberry slug. Larvae feeding on strawberry leaves, Cheshire, May 25.

Erythraspides pygmaea, grape sawfly. Larvae devouring grape leaves, Norwich, Aug. 6.

FRUIT INSECTS—(*Continued*)

Name	Locality, host, date and remarks.
Gaurotes cyanipennis, a long-horned beetle.	Adult on peach, Cheshire, May 23.
Grapholitha molesta, Oriental fruit moth.	Twig infestation of second generation larvae rather prominent in some peach orchards particularly in New Haven County. Northern part of the State generally free. Third generation threatened serious damage in August, but generally the fruit infestation was light.
Ithycerus noveboracensis, New York weevil.	Adults were moderately abundant on peach twigs near Cheshire, May 23, gnawing into the bases of the new shoots.
Lasioptera vitis, tomato grapevine gall.	Galls on grape, Wallingford, June 9; Chester, July 2; Sound View, July 15.
Leafhopper.	Eggs in bark of apple, Niantic, June 16.
Lecanium corni, European fruit scale.	On peach twigs, Nutley, N. J., June 3.
Lepidosaphes ulmi, oyster-shell scale.	On apple, Manchester, Oct. 3.
Ligyrus gibbosus, carrot beetle.	Adults on strawberry plants with *Diplotaxis atlantis*, Foxon, May 11.
Lygus sp., plant bugs.	Injury to pear fruit, Waterbury, Dec. 16, 1935; injured peach fruit, Beacon Falls, June 20.
Malacosoma americana, eastern tent caterpillar.	About as prevalent in southern Connecticut as in 1935, but less so in the northern part of the State. Egg-clusters common around New Haven, and began to hatch Apr. 4. Gray birch along roadside in Wallingford nearly defoliated May 14. Heavy infestation in Berlin with nests on beech, birch, hickory, linden, maple and oaks. Many caterpillars died from wilt and probably many were parasitized. Egg-clusters on apple, Hamden, Feb. 24; Winsted, Feb. 28.
Myzus ribis, currant aphid.	Injury to currant leaves, West Hartford, Sept. 22.
Nodonota punctícollis, rose leaf beetle.	Adults with injured pears, New Canaan, June 9.
Oberea bimaculata, raspberry cane borer.	Girdled raspberry shoots, New Haven, June 26, July 9; larva and injured red raspberry cane, Norwichtown, July 1.
Oxyptilus periscelidactylus, grape plume moth.	Larvae in webbed leaves, Nutley, N. J., June 3; Wallingford, June 9.
Paleacrita vernata, spring canker worm.	Unusually prevalent in western and northern Connecticut, and defoliated many unsprayed fruit, shade and woodland trees. Larvae on apple, Danbury, May 25; Bridgewater, May 29.
Paratetranychus pilosus, European red mite.	More prevalent than for the past 5 or 10 years, and there was a general outbreak in many orchards, due probably to a scarcity of natural enemies which had been reduced by spray applications. On apple, Manchester, Oct. 3.
Pelidnota punctata, spotted grapevine beetle.	Adult, New Haven, July 13.
Phobetron pithecium, hag moth.	Larva on auto windshield, Darien, Sept. 10.
Phyllophaga sp., May or June beetle.	White grubs injured strawberry plants, Uncasville, Sept. 12.
Popillia japonica, Japanese beetle.	More prevalent than ever before in Connecticut. Adults on grape, Hamden, July 20.
Psyllia pyricola, pear psylla.	Present generally but abundant only in occasional orchards. Eggs and honeydew present on pear, New Haven, Aug. 7.
Rhagoletis pomonella, apple maggot.	Present in usual numbers. Infested apples, Elmwood, Oct. 17; Meriden, New Haven, Oct. 21.

FRUIT INSECTS—(*Continued*)

Name — Locality, host, date and remarks.

Scolytus sulcatus, a bark beetle. Adults from bark of sweet cherry, Danbury, June 24.

Sphecodina abbotii, Abbot sphinx. Larva, July 7; larva on grape, East Hartford, July 28, Aug. 17.

Trialeurodes packardi, strawberry whitefly. Nymphs on strawberry leaves, Hamden, June 17.

Typhlocyba pomaria, white apple leafhopper. Infestation moderate to heavy in most apple orchards.

VEGETABLE INSECTS

Anasa tristis, squash bug. Generally less abundant than usual but caused damage in a few fields.

Aphis maidis, corn leaf aphid. Very abundant on green shucks of sweet corn at Mount Carmel in August. On Kaffir corn, Hamden, Aug. 3.

Ascia rapae, cabbage worm. Scarce on early and midseason cabbage. Moderately heavy infestation on late cabbage and cauliflower, New Haven, Oct. 6. Cauliflower had from one to seven larvae per plant, and was more heavily infested than cabbage.

Autographa brassicae, cabbage looper. Fairly heavy infestation on late cabbage and cauliflower, New Haven, Oct. 6. About 15 percent had pupated. Of the larvae counted, 49 percent were dead or in dying condition.

Aylax taraxaci, a gall. On dandelion, Southington, June 17.

Ceutorhynchus marginatus, a weevil or curculio. Larvae in heads of seed dandelions, Milford, May 25.

Crioceris asparagi, asparagus beetle. Shoots injured by adults, Colchester, May 4.

Cutworms. Present in normal numbers and caused the usual amount of damage throughout the State.

Deloyala clavata, clavate tortoise beetle. Adult on tomato, Middletown, June 11.

Diabrotica vittata, striped cucumber beetle. Present as usual. Caused severe damage to one field of summer squash plants, New Haven, May 11.

Empoasca fabae, potato leafhopper. Very abundant and destructive on potato and dahlia.

Epilachna varivestis (*corrupta*), Mexican bean beetle. About as prevalent as in 1935. Untreated beans defoliated in many places, June 23; adult in house, Wilton, Sept. 2.

Epitrix cucumeris, potato flea beetle. Caused the usual amount of damage to potatoes and tomatoes.

Heliothis obsoleta, corn ear worm. Present in moderate numbers. About 3 percent of ears of early sweet corn and 17 percent of late sweet corn infested. Somewhat less abundant than in 1935.

Hylemyia brassicae, cabbage maggot. More prevalent than usual in the Connecticut River Valley. Two fields of early cabbage showed heavy infestations and a 50 percent loss of crop. Also infested seed turnips, Milford, May 25.

Illinoia solanifolii, potato aphid. Severe infestation of potato and tomato in some localities. Several small fields of Irish Cobbler in the Connecticut River Valley were killed by this aphid. Sprays were necessary. Tomatoes in Guilford and West Haven, heavily infested, July 17; on tomato, Woodmont, July 7.

VEGETABLE INSECTS—(*Continued*)

Name — Locality, host, date and remarks.

Julus hortensis, garden millipede. Injured seed turnips, Milford, May 25.

Lema trilineata, three-lined potato beetle. Adults, South Norwalk, Aug. 4.

Leptinotarsa decemlineata, Colorado potato beetle. Moderately abundant and more prevalent than in 1935.

Papaipema nitela, stalk borer. Probably less prevalent than usual. Larvae in corn, Middletown, July 20.

Pegomyia hyoscyami, spinach leaf miner. More prevalent than in 1935. Caused serious damage to seed beets, Mount Carmel, June 24; injured beet leaves, New Haven, in July; in Swiss chard, Waterbury, July 21.

Pyrausta nubilalis, European corn borer. Present in large numbers in certain regions and caused severe damage to corn, potato and seed beets. Moths began emerging at Mount Carmel, May 20, earlier than usual. Larvae in cornstalks, Derby, July 17; Middletown, July 20; in potato stalks, East Granby, Aug. 1.

Tetranychus bimaculatus, common red spider. Severe injury to lima beans, leaves brown and webbed, Southington, Aug. 1.

Thrips tabaci, onion thrips. Appeared on onions early in June, much earlier than usual. On seed onions, Mount Carmel, Aug. 2.

Wireworms. Caused severe damage to potato tubers in one field in the Connecticut River Valley.

Zonosemata electa, a maggot of pepper and egg-plant. Adults on pepper, Hamden, July 11.

SHADE AND FOREST TREE INSECTS

Adelges abietis, spruce gall aphid. Common on Norway spruce throughout the State; 15 lots of specimens from 13 localities: On Norway spruce, Bridgeport, Nov. 27, 1935; Harrison, N. Y., Apr. 30; South Meriden, May 26; East Lyme, June 5; Greenwich, June 8, 27; East Haven, Waterbury, June 10; Gaylordsville, June 26; Cos Cob, Aug. 4; Branford, Aug. 25; Hamden, Aug. 27; West Hartford, Sept. 22; Ridgefield, Oct. 24; on white spruce, Southbury, Mar. 26; East Haven, June 10.

Adelges (Gillettea) cooleyi, Sitka spruce gall aphid. Common on blue spruce. On blue spruce, South Meriden, May 26; Hamden, June 6; Waterbury, Aug. 1; Hartford, Aug. 3; Waterford, Sept. 8; Ridgefield, Oct. 24; on Douglas fir, Ansonia, May 27.

Agonopteryx robiniella. Larvae webbing leaves of black locust, Rye, N. Y., May 29.

Agromyza schineri, poplar twig gall fly. Galls on poplar twigs, Griswold, Apr. 11.

Alsophila pometaria, fall canker worm. Prevalent on shade and woodland trees in the southern and southwestern portions of the State. Females, Ridgebury, Nov. 30, 1935; males, Branford, Dec. 9, 1935; crushed larvae and injured leaves, Norwalk, May 22; larvae on linden, May 23; larva, Litchfield, June 1; injured maple leaves, Cannondale, June 10; larvae on elm, Watertown, June 1.

Andricus seminator, wool sower. Gall on oak, Old Lyme, June 8.

Andricus singularis, small oak apple. Galls on pin oak, Ansonia, June 1.

Aphids. On elm, New Haven, June 15; aphid skins, Cannondale, Aug. 18; on linden and oak, Darien, Sept. 15; on white oak, Rockville, July 11; on linden, New Haven, Aug. 21; on white birch, Sharon, Sept. 30.

SHADE AND FOREST TREE INSECTS—(*Continued*)

Name	Locality, host, date and remarks.

Aphrophora parallela, pine spittle bug. Several froth masses containing nymphs, on white pine, Guilford, June 12.

Argyresthia thuiella, arborvitae leaf miner. Mined arborvitae leaves, Hamden, Nov. 20, 1935; Madison, June 19.

Cacoecia cerasivorana, cherry ugly-nest. Nest with larvae and pupae, on wild cherry, Danbury, June 22.

Camponotus herculeanus pennsylvanicus, black carpenter ant. Adult, from birch tree, Westport, Nov. 16, 1935.

Catocala neogama, the bride underwing. Larvae feeding on black walnut, New Britain, June 9; adult, New Haven, July 31.

Catogenus rufus, a Cucujid beetle. Adult under hickory bark, Griswold, Mar. 6.

Cecidomyia pinirigidae, pine needle gall. Galls on leaves of pitch pine, Griswold, Feb. 21.

Cecidomyia poculum, oak spangles. Galls abundant on white oak in the Stamford area, Aug. 24, according to E. P. Felt.

Chionaspis pinifoliae, pine leaf scale. Unusually abundant throughout the State. Found in nearly all nurseries where pines are grown. On mugho pine, Southport, Nov. 18, 1935; Wethersfield, Mar. 28; Bristol, Apr. 9; Westport, Aug. 10; Branford, Sept. 18; on pitch pine, Griswold, Feb. 21; on red pine, Cheshire, Feb. 25; on Scotch pine, West Hartford, Sept. 22.

Cimbex americana, elm sawfly. Larva on walk, North Branford, Sept. 10.

Coleophora laricella, larch case bearer. Eggs and mined larch leaves, Pleasant Valley, July 9.

Conotrachelus juglandis, walnut weevil. Larvae in butternuts, East Haven, July 28.

Corythucha arcuata, oak lacebug. On white oak, Collinsville, July 23.

Corythucha ciliata, sycamore lacebug. Adults from under sycamore bark, Derby, Nov. 27, 1935; on sycamore, Stamford, Sept. 22; New Haven, Oct. 23.

Corythucha ulmi, elm lacebug. Present on elm in Sharon and Winsted only in a few localities. Much less destructive than last year.

Cyllene caryae, hickory borer. Adults in house, emerged from fuel wood, New Haven, Feb. 13, 17, Mar. 30; Ansonia, May 12.

Cyllene robiniae, locust borer. Injured locust trees, Oakville, July 25.

Datana integerrima, walnut caterpillar. Larvae and cast skins, Shelton, Sept. 8.

Depressaria pulvipennella, a leaf folder or webworm. Adult under loose oak bark, Griswold, Feb. 7.

Diaspis carueli, juniper scale. On juniper, Fairfield, July 15.

Dichomeris marginellus, juniper webworm. Somewhat abundant on Irish juniper, New Canaan, Apr. 24, reported by E. P. Felt.

Dilachnus strobi, a pine leaf aphid. On white pine, East Hampton, July 30; New Haven, Oct. 15.

Dilachnus sp., an aphid. A few dead specimens on spruce, New Britain, May 22; on red pine, Washington, Sept. 24.

Diprion polytomum, European spruce sawfly. Observed throughout the season at Orange and other localities, but the insect did not cause serious damage.

Drepanaphis acerifoliae, an aphid. On maple, Pawcatuck, July 22.

SHADE AND FOREST TREE INSECTS—(*Continued*)

Name — Locality, host, date and remarks.

Ecdytolopha insiticiana, locust twig gall. Gall on twig of black locust, New Canaan, June 8.

Ennomos subsignarius, elm spanworm. Caterpillars devoured elm foliage in northwestern Connecticut, and poplar leaves in Derby, June 17.

Erannis tiliaria, lime-tree looper. Fairly common in northern and western Connecticut. Two larvae on linden, May 23; larvae on elm, Watertown, June 1; abundant on elms, New Britain, May 22, and in Guilford, July 4.

Eriophyes tiliae, a mite. Erineum on leaves of linden, Westport, June 30.

Eriophyid galls. On butternut, Hamden, July 9; on black walnut, Hamden, July 24; on white oak, Rockville, July 11.

Eriosoma americana, woolly elm aphid. New Haven, June 12.

Euceraphis mucida, a birch aphid. On cut-leaf birch, Hartford, July 10.

Eucosma gloriola, white pine tip moth. More prevalent than ever before and white pines are infested in nearly all parts of the State, July 22.

Eulia juglandana, a leaf roller. On hickory, Durham, May 21. Also observed in Berlin and Plainville.

Fenusa pumila, birch leaf mining sawfly. Very abundant on gray and white birch. Adults first observed at Hamden, May 8; larvae mining in leaves of European white birch, Woodbridge, May 28; in paper birch, Greenwich, June 5; Westport, Aug. 5.

Galerucella xanthomelaena, elm leaf beetle. Not destructively abundant. Adults, Hartford, June 4; injured leaves, Wallingford, Aug. 10; adults from houses, Bridgeport, Manchester, Aug. 19; hatched eggs and injured leaves, Somers, Sept. 9. Spotted infestations were observed in Ansonia, Barkhamsted, Berlin, Derby, Meriden, North Haven, and Torrington. The heaviest damage was in Ansonia and Derby.

Geometrid larva (unidentified). On elm, along road between Danbury and Waterbury, June 10.

Glycobius speciosus, maple borer. Adult, New Haven, July 11.

Gossyparia spuria, European elm scale. On elm, New Haven, June 12; abundant on healthy and weak elm trees, Waterford, June 16.

Graptolitha sp., a Noctuid moth. Larva on linden, May 23.

Halisidota caryae, hickory tussock moth. Larvae on hickory, Hamden, Aug. 11.

Hamadryas antiopa, spiny elm caterpillar. Larvae on willow, Weston, June 27.

Harmologa fumiferana, spruce budworm. Larvae and pupae from Colorado blue spruce, West Haven, June 4.

Hemerocampa leucostigma, white-marked tussock moth. Larva, Shelton, Aug. 1.

Hemichroa americana, a sawfly. Defoliated alders in a swamp near Middletown, according to E. A. Back. Mr. Wallace collected larvae from alder in East Hampton, which may be this species, and observed many defoliated alders in East Hampton and Prospect.

Hemimene albolineana, a Tortricid moth. Larvae on Colorado blue spruce, Turner's Falls, Mass., May 2; adult from spruce, New Haven, June 4.

Hylobius pales, pales weevil. Adults injured young trees of red pine and American larch, Hartford, Sept. 24.

SHADE AND FOREST TREE INSECTS—(*Continued*)

Name — Locality, host, date and remarks.

Hylobius radicis, a weevil. Larvae in Scotch pine, Old Lyme, May 5; New London, June 10; Sea Cliff, Long Island, N. Y., Aug. 28.

Hylurgopinus rufipes, native elm bark beetle. Fairly common in Connecticut. Adults and larvae hibernate in the galleries. A high percentage are parasitized by a Braconid four-winged fly.

Hypermallus villosus, twig pruner. More prevalent than in 1935. In hickory, Griswold, Feb. 7, New Haven, Aug. 10; in maple, New Milford, July 11; in oak, Middletown, Wilton, July 3; Hamden, Rye, N. Y., July 13; Beacon Falls, July 22; New Haven, Aug. 10; Wilton, Aug. 11.

Hyphantria cunea, fall webworm. Less prevalent in Connecticut than for many years. Nests were scarce.

Larva (unidentified), from ash tree, West Cornwall, Apr. 20.

Lasioptera clavula, dogwood club gall. Galls on dogwood, Greenwich, Mar. 10; Bridgeport, Apr. 14; Clinton, Oct. 5.

Leaf roller (unidentified). On poplar, Hamden, June 6.

Lecanium corni, European fruit scale. On black locust, Rye, N. Y., May 29.

Leperisinus aculeatus, ash timber beetle. Adults from fuel wood, New Haven, Aug. 11.

Lepidopterous pupae (unidentified). On Scotch pine, New London, June 10.

Lepidosaphes ulmi, oyster-shell scale. On poplar, Riverside, June 10; on butternut, West Haven, July 22; on Japanese willow, West Haven, Sept. 8.

Lithocolletis hamadryadella, oak blotch leaf miner. In leaves of white oak, Noroton, Aug. 3.

Longistigma caryae, large twig aphid. On sycamore, Sea Cliff, Long Island, N. Y., July 6; on butternut, West Haven, July 22.

Macrodactylus subspinosus, rose chafer. Adults present in large numbers feeding on elm in certain sections of Colchester.

Magdalis sp. Adult under loose bark, Griswold, Mar. 13.

Malacosoma americana, eastern tent caterpillar. Somewhat less prevalent than in 1935, but very abundant in central and southern Connecticut. Less so in northern portion of the State. Not only were wild cherry and apple trees infested but in some localities beech, birch, hickory, linden, maple, oak and willow trees were covered with nests. Many caterpillars died before pupating, presumably from the wilt disease.

Malacosoma disstria, forest tent caterpillar. More prevalent than for many years. Observed a few caterpillars crawling on trunks of paper birch, New Haven, May 19; moderately abundant on trunks of oak, Windsor, June 4; Mr. Zappe observed them in Canaan, Litchfield, Salisbury, Sharon and Thompsonville.

Menecles insertus, a Pentatomid bug. Adult, under loose bark, Griswold, Mar. 13.

Midge galls (unidentified). On ash, Winsted, Sept. 5; on maple, Wilton, Sept. 8.

Neolecanium cornuparvum, magnolia scale. On magnolia, New Haven, July 10; reported as abundant and injurious on a magnificent tree in Middletown, by E. P. Felt.

Neuroterus floccosus, oak flake gall. On white oak, Shelton, Aug. 31; Norwalk, Oct. 8.

Noctuid (unidentified). Larva eating leaves of red maple, East Windsor, June 18.

Oecanthus pini, pine tree cricket. Eggs in white pine twigs, Plainfield, May 22.

SHADE AND FOREST TREE INSECTS—(*Continued*)

Name	Locality, host, date and remarks.

Olethreutes abietana, a spruce leaf miner. Injured spruce leaves, Hartford, Apr. 27.

Orthosoma brunneum, lesser prionus. Adult, New Haven, July 31.

Paleacrita vernata, spring canker worm. Unusually prevalent in northern and western Connecticut, and defoliated many fruit, shade and woodland trees, including elms in Lakeville, Sharon and Simsbury. Adult, Bridgeport, Mar. 16; Westport, Mar. 25; larvae on elm, Danbury, May 25; larvae, Litchfield, June 1; larvae on elm, Watertown, June 1.

Paralechia pinifoliella, a pine leaf miner. Larvae boring in needles, Griswold and Branford, Mar. 17, 24.

Parandra brunnea, Parandra borer. Characteristic galleries in dead maple wood, Darien, July 21.

Paratetranychus bicolor, oak mite. Eggs on silver maple, Stamford, Nov. 8, 1935.

Paratetranychus ununguis, spruce mite. Common on conifers throughout the State. On spruce, Hartford, Apr. 27; Danielson, May 1; West Haven, May 20; New Haven, June 4; Manchester, June 18; Greenwich, June 27; Canaan, Sept. 28; Sharon, Sept. 30; on Chamaecyparis, New Canaan, May 25; on Scotch pine, Ansonia, May 27; on arborvitae, New Canaan, June 23; Old Lyme, July 7; on larch, Pleasant Valley, July 9; on hemlock, Greenwich, June 27; on juniper, Hamden, July 10; Waterbury, July 18; Westport, Oct. 13; on Retinospora, Waterbury, July 18.

Phenacoccus acericola, woolly maple leaf scale. On sugar maple, East Norwalk, July 13; Norwich, Aug. 4.

Phyllaphis fagi, woolly beech aphid. Reported as abundant and injurious to beech trees in Middletown, by E. P. Felt.

Phyllocoptes aceris-crumena, maple spindle gall. On maple, Middletown, July 30.

Phyllocoptes quadripes, maple bladder gall. On silver maple, Westport, May 20; Norwalk, May 22; Hamden, May 23; Wallingford, July 24.

Phylloxera caryaecaulis, hickory leaf-stem gall aphid. Here and there in small numbers in southwestern Connecticut, July 24, according to E. P. Felt.

Phytophaga rigidae, beaked willow gall. Galls on willow, New Haven, Mar. 18.

Pineus strobi, pine bark aphid. Plainville, May 13; Kent, June 2; Cheshire, July 27.

Pissodes approximatus, a pine weevil. Injured Scotch pines at Old Lyme, May 5, Aug. 24.

Pissodes strobi, white pine weevil. Dead white pine leader with larval cells, Griswold, Feb. 28; in white pine, Cheshire, July 27; in spruce, Hartford, July 8; Newtown, July 14.

Plagiodera versicolora, imported willow leaf beetle. Adult, larva and pupa on willow leaves, Southboro, Mass., June 29; adults and larvae on willow, Springfield, Vt., July 29.

Platysamia cecropia, cecropia moth. Caterpillars feeding on flowering dogwood, Stamford, Aug. 24, according to E. P. Felt.

Porthetria dispar, gypsy moth. Several egg-clusters from underside of loose oak bark, Griswold, Feb. 7.

Prionoxystus robiniae, carpenter worm. Pupa skins from oak, Waterbury, June 30.

Prionus laticollis, broad-horned Prionus. Adult, Hamden, July 13.

Priophorus acericaulis, maple leaf-stem borer. Washington, June 6; Cannondale, June 10.

SHADE AND FOREST TREE INSECTS—(*Continued*)

Name	Locality, host, date and remarks.

Prociphilus tessellatus, woolly alder aphid. On silver maple, Hartford, July 7, 8.

Pulvinaria vitis, cottony maple scale. On maple, Bridgeport, July 1; on elm, Stony Creek, July 16.

Recurvaria apicitripunctella, a hemlock leaf miner. Fairly abundant in Hamden, Apr. 13.

Reticulitermes flavipes, termite. Wingless specimens from birch tree, Westport, Nov. 16, 1935.

Retinodiplosis inopis, gouty pitch pine midge. Light to moderate infestation on Scotch pine, New Hartford, Apr. 20.

Rhabdophaga brassicoides, willow cabbage gall. Three galls on willow, Griswold, Apr. 11.

Rhabdophaga strobiloides, pine cone gall. Three galls on willow, Griswold, Apr. 11.

Rhagium lineatum, ribbed pine borer. Adult under loose bark, Griswold, Mar. 6.

Rhyacionia buoliana, European pine shoot moth. Very abundant in some plantations in southwestern Connecticut. Heavy infestation in mugho pine, Greenfield Hill, May 23; in red pine, Waterbury, July 15.

Saperda candida, round-headed apple tree borer. Injured mountain ash, Bristol, Oct. 23.

Saperda tridentata, elm borer. Adult from elm, Ansonia, May 12.

Sawfly larvae (unidentified, probably *Hemichroa americana*). On alder, East Hampton, Prospect, Sept. 10; on elm, North Branford, Sept. 10.

Schizura concinna, red-humped caterpillar. Caterpillars injured flowering dogwood, Stamford, Aug. 24, according to E. P. Felt.

Scolytus multistriatus, small European elm bark beetle. Many adults observed entering sickly elms, Greenwich, Aug. 24, by E. P. Felt.

Scolytus quadrispinosus, hickory bark beetle. Larvae in galleries in hickory bark, Griswold, Feb. 7.

Stenosphenus notatus, a long-horned beetle. Two adults under loose elm bark, Griswold, Feb. 7.

Stilpnotia salicis, satin moth. Caterpillars defoliated poplar trees in Bridgeport and Waterbury. Two larvae from Waterbury, June 15.

Tetraleurodes mori, mulberry whitefly. Pupa cases on sycamore leaves, New Haven, Oct. 23.

Tetralopha robustella, a Pyralid moth. Frass balls containing larval skins, on red pine, Plymouth, Feb. 29; New Haven, May 12; Clinton, Deep River, Aug. 25; on mugho pine, Branford, Sept. 18.

Thrips (unidentified). Nymphs on mulberry, Darien, June 12; nymphs under dead bark of mountain ash, South Meriden, Sept. 1.

Thysanocnemis fraxini, a small weevil. Larvae in ash seeds, Nov. 12, 1935.

Toumeyella liriodendri, tulip tree scale. New Haven, Mar. 18; Milford, July 30; Redding Center, Aug. 1; Nichols, Aug. 25.

Trichiocampus viminalis, poplar sawfly. Practically all Carolina poplars in Bridgeport were infested, and some trees were defoliated, Aug. 20.

Upis ceramboides, a Tenebrionid beetle. Adults under loose elm bark, Griswold, Feb. 7.

Xylobiops basillare, red-shouldered twig borer. Adults in branch of Judas tree, New Britain, June 9.

Xylotrechus colonus, the rustic borer. Adults from fuel wood, Hartford, Mar. 13; New Haven, Apr. 4; Guilford, July 28.

Insects of Ornamental Shrubs and Vines

Name	Locality, host, date and remarks.

Agrilus communis rubicola, rose stem girdler. Much less prevalent than usual on susceptible varieties of roses.

Alypia octomaculata, eight-spotted forester. Adult, Bethany, May 29.

Aphids (unidentified). On spiraea, Hamden, May 23.

Aulacaspis pentagona, white peach scale. On lilac, Darien, Apr. 24, according to E. P. Felt.

Brachyrhinus sulcatus, black vine weevil. Injured Taxus plants, Bethel, June 24, according to E. P. Felt.

Cacoecia rosana, a leaf roller. On privet, West Haven, June 4.

Chionaspis euonymi, euonymus scale. On evergreen euonymus, Guilford, Feb. 28, Mar. 18.

Chionaspis pinifoliae, pine leaf scale. Unusually prevalent on mugho pines in nurseries and ornamental plantings.

Cingilia catenaria, chain-spotted geometer. Larvae stripped nearly all foliage from native shrubs and trees on an island, Groton, July 31.

Clastoptera sp., a spittle bug. Nymphs in froth masses on Retinospora, Clinton, July 22.

Coccus sp., a soft scale. On English ivy, Sharon, Aug. 8.

Dichomeris marginellus, juniper webworm. More prevalent than in 1935. Larvae in webs on juniper, Hamden, May 7; webs and pupa skins on juniper, Torrington, June 15.

Epicauta marginata, margined blister beetle. Adults (on roses), New London, July 27.

Eriococcus azaleae, azalea scale. On rhododendron, Hartford, Aug. 13.

Eriophyes eucricotes, a blister mite. On matrimony vine, South Norwalk, Dec. 13, 1935; Danbury, June 13; another species on buttonbush, Westport, July 20.

Hormaphis hamamelidis, witch-hazel cone gall. Galls on witch-hazel, Southbury, July 11; Cromwell, July 30; Mount Vernon, N. Y., Aug. 4; New Haven, Aug. 25.

Hormomyia canadensis, June berry lipped gall. Galls on June berry or shadbush, Hebron, June 29.

Lachnus sp. Wingless aphids on juniper, Newington, June 10.

Lepidosaphes ulmi, oyster-shell scale. On red twig dogwood, Waterbury, Mar. 17; on lilac, Guilford, Mar. 18; Riverside, June 10.

Macrobasis torsa, a blister beetle. Adults defoliated hercules club, Derby, June 3; adults, Ridgefield, June 19.

Macrodactylus subspinosus, rose chafer. Locally abundant around Stamford and Colchester in June. Less prevalent than usual around New Haven.

Neotetranychus buxi, a boxwood mite. On boxwood, Old Lyme, July 7, Sept. 21; Saugatuck, Aug. 29.

Omphalocera dentosa, barberry webworm. Old webs with leaves and frass, on barberry, Milford, Mar. 19.

Poecilocapsus lineatus, four-lined plant bug. Unusually prevalent in 1936. Injured Hall's honeysuckle, Hamden, June 30; forsythia, Meriden, July 7.

Popillia japonica, Japanese beetle. More prevalent than ever before in Connecticut, and injured roses, dahlias and other flowering plants. Adults on rose, Hamden, July 21, 30; adults, New London, July 27.

INSECTS OF ORNAMENTAL SHRUBS AND VINES—(*Continued*)

Name	Locality, host, date and remarks.

Pseudocneorrhinus setosus, a weevil from Japan. Adult on privet, West Haven, June 4.

Pseudococcus sp., a mealybug. On Taxus, New Haven, June 10.

Stephanitis rhododendri, rhododendron lacebug. Injured rhododendron leaves with eggs in midrib, Hamden, Apr. 22; Bridgeport, May 12; Simsbury, Aug. 4; injured mountain laurel, Waterbury, May 4.

Tetranychus bimaculatus, red spider. On English ivy, Sharon, Aug. 8.

Thrips. On privet, Hamden, July 13.

Trichionotus affinis, a Scarabaeid beetle. On rose, Branford, June 23.

INSECTS OF FLOWERS AND GREENHOUSE PLANTS

Acucephala albifrons, a leafhopper. Adults on chrysanthemum, Springdale, Sept. 2.

Aphids (wingless specimens). On aquarium plants, in house, New Haven, Mar. 26.

Apion rostrum, a small weevil. Adults from seed pods of *Baptisia*, Waterbury, Dec. 12, 1935.

Calomycterus setarius, an Oriental weevil. Larvae and pupae very abundant in soil at Stratford; somewhat less so at Sharon. Adults emerging June 22, and fed on *Desmodium*, *Lespedeza*, and other legumes. A new infestation found in Fairfield.

Chauliognathus pennsylvanicus, soldier beetle. Adults on veronica, Hamden, Aug. 19.

Coccus hesperidum, soft scale. On grapefruit tree, Stony Creek, May 5; on English ivy, Norwichtown, Sept. 5.

Diabrotica duodecimpunctata, twelve-spotted cucumber beetle. Adult, New Haven, Nov. 9, 1935.

Diarthronomyia hypogaea, chrysanthemum gall midge. Galls on chrysanthemum leaves, Westport, Mar. 17; North Haven, July 22.

Dipterous larvae. In buds of Japanese iris, Darien, July 3.

Empoasca fabae, potato leafhopper. Heavy infestation on dahlia at Mount Carmel with much dwarfing, tip burn and leaf curl in July. Reports of serious damage in several sections of the State. On dahlia, Hartford, Aug. 19.

Epicauta pennsylvanica, black blister beetle. Adults on gladiolus, Portland, Aug. 25.

Euphoria fulgida, a green Scarabaeid beetle. Adult in garden, Sound View, June 29.

Euschistus ictericus, a Pentatomid plant bug. Adult, New Haven, Aug. 19.

Galerucella nymphaeae, a water lily leaf beetle. All stages found at North Windham, where the foliage of the white water lily had been defaced, Aug. 26. (Reported by Doctor Back.)

Graphocephala coccinea, a leafhopper. Adults on chrysanthemum, Springdale, Sept. 2.

Julus hortensis, garden millipede. Several specimens, Bridgeport, Feb. 1; in roots of bleeding heart, Guilford, May 26.

Lepidosaphes gloveri, Glover's scale. On orange peel, Lakeville, Mar. 23.

Lepidosaphes ulmi, oyster-shell scale. On *Pachysandra terminalis*, New Haven, Sept. 10.

Limax maximus, giant garden slug. In garden, New Haven, Sept. 17.

Lycophotia margaritosa saucia, variegated cutworm. Three larvae from greenhouse, New London, Feb. 5; larvae on gladiolus, Litchfield, Aug. 15.

INSECTS OF FLOWERS AND GREENHOUSE PLANTS—(*Continued*)

Name — Locality, host, date and remarks.

Lygus pratensis, tarnished plant bug. Injured aster, veronica and vinca, Torrington, June 30.

Macrodactylus subspinosus, rose chafer. Abundant locally but not generally. Adults injured flowering plants, Fair Haven, June 11.

Papaipema nitela, stalk borer. Larva in stem of marsh mallow, East Haven, July 2.

Paria canellus var. *quadrinotatus*, a common leaf beetle. Adults devoured rose leaves in greenhouse, New Haven, Oct. 21.

Phlyctaenia rubigalis, greenhouse leaf tier. Bridgeport, Oct. 12.

Poecilocapsus lineatus, four-lined plant bug. Apparently more prevalent than usual. On Chinese lantern plant, Riverside, June 10; on chrysanthemum, Guilford, June 22; Branford, June 23; Meriden, June 24; East Haven, July 2; on heliotrope, New Haven, June 19; on pepper plants, Windsor, June 24; on aster, Hartford, June 30.

Polydesmus moniliaris, a millipede. Injured Madonna lilies, Hartford, May 18.

Pomphopoea sayi, Say's blister beetle. Heavy infestation in small area in Sharon. All lupine blossoms eaten on several premises and nearly a peck of adults were collected, June 11.

Popillia japonica, Japanese beetle. More prevalent than heretofore in Connecticut. Severely injured dahlia, roses and other garden flowers. Adult on hollyhock, Hamden, July 18; adult, Southport, July 20; adults on *Polygonum cuspidatum*, Hartford, July 23; adults on various flowers, New Haven, Aug. 3, 11, 19.

Pseudococcus citri, citrus mealybug. Eggs and young on gardenia, Stamford, Nov. 8, 1935; on gardenia, New Haven, Apr. 24; on coleus, New Milford, May 1.

Reticulitermes flavipes, common termite. Injured chrysanthemum plants in greenhouse, Bristol, Apr. 1.

Saissetia hemisphaerica, hemispherical scale. On fern, Hamden, Aug. 22.

Spittle bug. Nymphs on African daisy (*Gerbera*) in greenhouse, Hamden, Mar. 30.

Taeniothrips simplex (*gladioli*), gladiolus thrips. On gladiolus, Greenwich, July 14; Lakeville, Aug. 25.

Tarsonemus pallidus, cyclamen mite. On snapdragon, New Haven, Oct. 7.

Tetranychus bimaculatus, common red spider. On *Brougmansia*, Noank, May 6.

Triphleps insidiosus, a Coreid bug. On chrysanthemum, Bridgeport, Aug. 26.

INSECTS INFESTING STORED FOOD PRODUCTS

Dermestes cadaverinus, a larder beetle. Adult from built-in incinerator, in house, Hamden, Mar. 13.

Dermestes lardarius, larder beetle. Adults from houses, New Haven, Apr. 22, May 15; Naugatuck, May 29.

Dermestid (unidentified). Larva in closet, New Haven, Oct. 15.

Ephestia kuehniella, Mediterranean flour moth. Adult in house, New Haven, June 24.

Oryzaephilus surinamensis, saw-toothed grain beetle. Adults in pantry, Norwich, Dec. 19, 1935.

Plodia interpunctella, indian-meal moth. Adults from houses, Pine Orchard, Mar. 11; Woodbridge, June 12.

INSECTS INFESTING STORED FOOD PRODUCTS—(*Continued*)

Name — Locality, host, date and remarks.

Ptinus brunneus, brown spider beetle. Adults infesting grain in bags, New Britain, May 1, 11.

Sitodrepa panicea, drugstore beetle. Adults, from houses, New Haven, Dec. 20, 1935; Manchester, Sept. 29.

Sitophilus granaria, granary weevil. Adult from house, Hamden, May 9.

Tenebroides corticalis, a Tenebrionid beetle. Adult infesting grain, New Britain, May 11.

Typhaea fumata, a small beetle. Adult in ground limestone (accidental), Litchfield, Sept. 22.

HOUSEHOLD INSECTS

Anisopus alternatus, a fly. Adult in house, Stonington, Dec. 30, 1935.

Anthrenus scrophulariae, carpet beetle. Larvae in house, Norwich, Hartford, Nov. 5, 1935; larva in wool clothing, New Haven, June 29; larvae in house, Stamford, July 18.

Anthrenus verbasci, museum beetle. Adult in house, Hamden, Mar. 2; larva, Norwich, Sept. 1.

Ants (unidentified; specimens broken). In house, Hartford, Feb. 27; New Haven, Mar. 2, May 11, 15; Hamden, May 4, June 2; Bridgeport, Apr. 8; Meriden, June 27.

Attagenus piceus, black carpet beetle. Unusually prevalent; 23 lots from 11 localities. Larvae in house, Hamden, Jan. 13, May 23; adults, June 16; larvae, July 14; larvae, New Haven, Mar. 30, 31, Apr. 21, May 7, July 7, 9; adult, July 22; larvae, Hartford, Apr. 18, 29, May 14, June 3; larva, East Haven, May 6; Bridgeport, Apr. 22; Bristol, May 9; Southington, Apr. 21; Waterbury, June 26; West Haven, Jan. 29; Wethersfield, Mar. 4; Windsor, Apr. 21.

Blattella germanica, German cockroach. Adult in house, Winsted, Dec. 30, 1935.

Bryobia praetiosa, clover mite. Four mites in house, North Haven, Jan. 29; Wallingford, May 11.

Calliphora erythrocephala, a blue-bottle fly. Two adults in house, Stonington, Dec. 30, 1935.

Calliphora vomitoria, a blue-bottle fly. Adult in house, Stonington, Dec. 30, 1935.

Cynomyia cadaverina, a carrion fly. Larvae in house, North Stonington, Nov. 9, 1935.

Formica sp. (unidentified). Adult from house, New Haven, Apr. 29; Bridgeport, Oct. 9.

Fucellia maritima, a fly. Three adults in house, Stonington, Dec. 30, 1935.

Julus venustus, a millipede. In house, Hartford, Nov. 2, 1935.

Lasius sp., ants. Winged females in house, New Haven, Feb. 27, May 25; Orange, June 27; around porch, Greenwich, July 13.

Musca domestica, common house fly. Four adults in house, Stonington, Dec. 30, 1935.

Muscina pascuorum, an introduced fly. Adult in house, Stonington, Dec. 30, 1935.

Muscina stabulans, stable fly. Adult in house, Stonington, Dec. 30, 1935.

Myrmica sp., an ant. In house, Norwalk, Sept. 17.

Periplaneta americana, American cockroach. Adult in house, Hamden, Nov. 15, 1935; nymphs and adults in bales of cotton yarn from South Carolina, Hamden, June 2; nymph and adult in bakery, New Haven, Aug. 28.

HOUSEHOLD INSECTS—(*Continued*)

Name	Locality, host, date and remarks.

Pollenia rudis, cluster fly. Thirty-six adults in house, Stonington, Dec. 30, 1935.

Porcellia scaber, a Crustacean sow bug or pill bug. Seven specimens from house cellar, Milford, Mar. 21.

Psocids. Adults in house, New Haven, July 31.

Scutigera forceps, house centipede. Adult in factory, New Haven, Apr. 30.

Seioptera vibrans, a fly. Adult in house, Stonington, Dec. 30, 1935.

Silverfish (badly damaged). Four specimens in bakery, New Haven, Aug. 26; in house, Arlington, Mass., Sept. 22.

Sitodrepa panicea, drugstore beetle. Adult in house, New Haven, Dec. 20, 1935; larva in writing paper, Naugatuck, Nov. 15, 1935.

Tineola biselliella, webbing clothes moth. Several larvae in cotton sanitary pads wrapped in cellophane, Hartford, Jan. 6.

Troctes pulsatorius, a Corrodentid. In house, Greenwich, Sept. 19.

INSECTS INFESTING TIMBERS AND WOOD PRODUCTS

Camponotus herculeanus ligniperda noveboracensis, a carpenter ant. Workers in house, Norfolk, July 22.

Camponotus herculeanus pennsylvanicus, black carpenter ant. In all, 21 different lots from 10 localities, as follows: Workers in house, New Haven, Dec. 23, 1935; specimens, Feb. 19, Apr. 23, May 7, 11, 12, June 8, July 29, Aug. 5, Oct. 31; in house, Trumbull, Mar. 23; in fuel wood, Wilton, Apr. 9; in house, Waterbury, Apr. 17; in fuel wood, Sept. 25; in house, Hamden, Apr. 20, May 25; in house, Milford, May 28; in garage, Torrington, June 8; Stamford, June 8; in building, Danbury, July 6; in house, New London, Sept. 15.

Larvae (Bostrichid or Lyctid beetle). In antique furniture, New Haven. Apr. 18.

Lyctus sp., powder-post beetle. Injury to antique desk, Hartford, Mar. 16; oak wood of boat, Hampton, Apr. 3; house, Salem, Apr. 6; house, Woodbridge, May 12; damaged wood, Hamden, July 7; house, Windsor Locks, Sept. 28; Collinsville, Oct. 17.

Phymatodes variabilis, a small long-horned beetle. Adults from fuel wood in house, New Haven, Apr. 4; Hartford, Apr. 27; Bristol, June 23; Groton, July 2.

Reticulitermes flavipes, eastern subterranean termite. In all, 38 different lots from 26 different localities. From houses or buildings: New Haven, Apr. 8, 16, 21, 23, May 4, 7, 9, 11, 13, 15, 25, Oct. 15; Hazardville, Dec. 9, 1935; Southport, Mar. 4; Danbury, Mar. 7; Montville, Mar. 25; Simsbury, Mar. 27; Fairfield, Apr. 1; Hartford, Apr. 1, Sept. 24; Salem, Apr. 6; Madison, Apr. 8; South Norwalk, Apr. 9; Norwich, Apr. 11; Patterson, N. Y., near New Fairfield, Apr. 14; Greenwich, Apr. 15; Mystic, Apr. 21; New Milford, Apr. 27; Kensington, May 5; Roxbury, May 7; Stamford, May 21; Branford, July 7; Manchester, Aug. 16; New York City, Aug. 20; West Simsbury, Sept. 18; Meriden, Sept. 25; Oakville, Oct. 26; Rocky Hill, Oct. 28.

Xylocopa virginica, carpenter bee. Tunneling in wood of house porch, West Haven, June 11.

INSECTS OF SOIL AND LAWN

Anomala orientalis, Asiatic beetle. Rather prevalent in untreated lawns in New Haven and West Haven. Grubs in lawn, New Haven, Sept. 1, 29, Oct. 22; West Haven, May 20; Norwalk, Sept. 23.

INSECTS OF SOIL AND LAWN—(*Continued*)

Name — Locality, host, date and remarks.

Ants (unidentified). In soil near house, New Haven, Mar. 31; Bridgeport, Oct. 10.

Aphodius fimetarius, a dung beetle. Adults in manure, Hamden, May 14.

Autoserica castanea, Asiatic garden beetle. Adults from soil, Greenwich, July 2; grubs in lawn, Norwalk, Sept. 23.

Blissus hirtus, hairy chinch bug. Adult from lawn, Hamden, July 9; specimens and injured grass, Bristol, July 15; Westport, July 22; Greenwich, Sept. 17.

Formica exsectoides, mound-building ant. Adults and pupae, Danbury, July 18.

Lasius niger americana, an ant. In lawn, New Haven, Sept. 24.

Lasius niger neoniger, an ant. Females from golf course, New Haven, Sept. 14.

Lasius sp., ants. Winged adults in dooryard, Groton, Apr. 24; winged adults, North Haven, Sept. 8, Oct. 13.

Macrodactylus subspinosus, rose chafer. Grubs from lawn, Lawrence, Long Island, N. Y., Nov. 15, 1935.

Ochrosidia villosa, a Scarabaeid beetle. Grubs from lawn, Lawrence, Long Island, N. Y., Nov. 15, 1935; Greenwich, Oct. 3, 14.

Pachystethus lucicola, light-loving grapevine beetle. Grubs from lawn, Hamden, Sept. 24.

Phyllophaga sp., May or June beetle. Grubs from lawn, Hamden, Sept. 24.

Reticulitermes flavipes, eastern subterranean termite. Adults from lawn, Hamden, May 11.

Sphecius speciosus, cicada killer. Unusually abundant, nesting in hard ground, New Haven, July 27, Aug. 3; Mount Carmel, July 24; Stony Creek, Aug. 12; Norwichtown, Aug. 18.

INSECTS ANNOYING MAN AND DOMESTIC ANIMALS

Ctenocephalus canis, dog flea. Adults from cellar of house, Thomaston, July 1.

Hypoderma bovis or *H. lineata*, cattle grub. Larvae in cattle, Norwich, Mar. 10.

Liponyssus sylviarum a bird mite. House became infested from a bird's nest on porch, and inhabitants were bitten by the mites, Westport, June 27; Isle La Motte, Vt., Aug. 13.

Mosquitoes (unidentified; badly damaged). Adults, New Haven, July 24.

Phthirius pubis, crab louse. On person, Hamden, Sept. 14.

SPIDERS

Anyphaenella saltabunda, a spider. Adult and egg-mass on under side of a leaf, East Haven, July 2.

Araneus trifolium, the shamrock spider. New Haven, Aug. 10.

BENEFICIAL INSECTS

Anatis quindecimpunctata, 15-spotted ladybeetle. Adult on white birch tree, Torrington, June 4; adult on screen door, New Haven, Aug. 11.

Anystis agrilis, a red mite predaceous on other mites. On white pine, Hamden, June 30.

BENEFICIAL INSECTS—(*Continued*)

Name	Locality, host, date and remarks.

Apateticus sp., a soldier bug. Devouring gypsy moth caterpillar, Windsor, June 13.

Calosoma scrutator, caterpillar hunter, a large ground beetle. Adult taken at light, Shelton, May 25.

Ceratomegilla fuscilabris, spotted ladybeetle. Adults, Marion, Oct. 14.

Coccinella novemnotata, nine-spotted ladybeetle. Pupa, Wallingford, July 17, adult emerged July 20; several adults on aphid-infested pepper plants, North Haven, July 27.

Coccinella transversoguttata, five-spotted ladybeetle. Adult on pepper plants infested with aphids, North Haven, July 27.

Conwentzia hageni, a Neuropteroid insect. Cocoons on arborvitae, Old Lyme, July 7; cocoons on juniper, Hamden, July 10.

Dibrachys scutellata, a Chalcidoid parasite. Adults reared from nest of a mud-dauber wasp, Storrs, May 4.

Hippodamia convergens, convergent ladybeetle. Larvae from tomato, Branford, July 24; West Haven, July 22, adults emerged, July 30.

Hyperaspis signata, a small black ladybeetle. Larvae feeding on tulip tree scale, New Haven, Nov. 23, 1935.

Hyposoter (Campoplex) fugitivus, a Hymenopterous parasite. On red-humped caterpillars, Sound View, Sept. 8.

Ladybeetle (unidentified). Larva on spruce, Tariffville, July 3; larvae on potato and tomato, Higganum, July 21; larvae feeding on tulip tree scale, Redding Center, Aug. 1.

Malachius aeneus, a predaceous flower beetle. Adult in house, Hamden, Apr. 8; adult, Norwichtown, Apr. 16.

Megarhyssa atrata, black long-sting. Adult females, East Haven, June 19; Hartford, July 21.

Megarhyssa lunator, lunate long-sting. Adult female on trunk of English walnut tree, North Haven, June 13.

Microplitis kewleyi, a Braconid parasite of cutworms. Hartford, Sept. 14.

Pentatomid bug (unidentified). Nymphs devouring Mexican bean beetle, Woodmont, July 24.

Syntomosphyrum orgyrae, a Hymenopterous parasite. Adult reared from nest of mud-dauber wasp, Storrs, May 4.

Syrphid larvae (unidentified). Three specimens on spruce infested with aphids, New Britain, May 22.

Tenodera sinensis, Chinese praying mantid. Adult male, West Haven, Sept. 30.

MISCELLANEOUS

Alaus oculatus, eyed click beetle. Adults, Plainfield, June 12; New Haven, June 29.

Amara sp., a small ground beetle. Adults in building, New Haven, July 21.

Automeris io, io moth. Larva, Canaan, Sept. 12.

Aylax sp. (unidentified). Galls on Nepeta, Hamden, June 18.

Benacus griseus, a giant water bug. Adults, Guilford, June 9; West Haven, July 21; New Haven, July 27.

MISCELLANEOUS—(*Continued*)

Name	Locality, host, date and remarks.
Chauliodes sp. (unidentified), a fish fly.	Egg-mass on green painted woodwork, Cheshire, June 25; adult, Hamden, Aug. 15.
Chrysochus auratus, green gold beetle.	Adults, on dogbane, Hamden, July 6; on milkweed, Fairfield, July 18.
Corydalis cornuta, hellgramite or dobson fly.	Adults, male and female, Wallingford, July 6; adult, New Haven, July 15.
Dendroleon obsoletum, an ant lion.	Adult, Wallingford, July 17.
Diacrisia latipennis, an Arctiid moth.	Adult in house, North Haven, June 23.
Estigmene acraea, salt marsh caterpillar.	Larva, May 23.
Euthochtha galeator, a Coreid plant bug.	Adults, New Haven, July 13.
Fumea casta, a Psychid moth.	Winter cases, West Hartford, May 20.
Gryllotalpa hexadactyla, northern mole cricket.	Adult in basket of California plums at a roadside stand, North Haven, Aug. 21; adult in restaurant, Danbury, Aug. 22.
Lagoa crispata, crinkled flannel moth.	Larva, Danielson, Sept. 17.
Metriona bicolor, golden tortoise beetle.	Adult, Norwichtown, June 4.
Neuropteroid fly (unidentified; Family Sialidae).	Two specimens in house, Lebanon, June 12.
Parcoblatta virginica, a woodland cockroach.	Adults, Norwich, June 12.
Phanaeus carnifex, a green Scarabaeid beetle.	Adult, Hartford, June 20.
Phyllophaga gracilis, a small May or June beetle.	Adults, Storrs, Aug. 8.
Podops cinctipes, a Pentatomid bug.	Adult from Massachusetts, Apr. 30.
Psocus venosus, a Corrodentiid.	Adults on pine, Bethany, Aug. 13.
Rhytidoloma saucia, a Pentatomid bug.	Adult from Massachusetts, Apr. 30.
Scopelosoma morrisoni, a Noctuid moth.	Adult in maple sap, Clinton, Mar. 13; adult at automobile headlight, Mar. 17.
Scopelosoma tristigmata, a Noctuid moth.	Adult at automobile headlight, Mar. 17.
Scopelosoma walkeri, a Noctuid moth.	Adult at automobile headlight, Mar. 17.
Serica sp. (unidentified), a small Scarabaeid beetle.	Adult, New Haven, Aug. 5.
Sisyrosea textula, a Cochliid moth.	Larva, Westport, Sept. 12.
Sphinx gordius, the Gordian sphinx.	Adult, Wallingford, June 4.
Tibicen sp., a cicada.	Pupa skins, Ridgefield, Aug. 7.
Tropaea luna, luna moth.	Cocoon, North Woodbury, Oct. 30.

Conference of Connecticut Entomologists

By invitation, the thirteenth annual conference of entomologists working in Connecticut was held in Memorial Hall, Massachusetts State College, Amherst, Mass., on Friday, October 16, 1936, in connection with the exercises commemorating the fiftieth anniversary of the beginning of the work of Charles Henry Fernald. Mr. Neely Turner was elected chairman, and 98 persons were present. Luncheon was served in the

College dining hall and the commemorative exercises, over which Professor Charles P. Alexander presided, followed the luncheon.

The following program was carried out:

GREETING, Professor C. P. Alexander, Amherst, Mass.

SOME ENTOMOLOGICAL FEATURES OF 1936, W. E. Britton, New Haven, Conn.

RESULTS ACCOMPLISHED IN GYPSY MOTH WORK, 1936, S. S. Crossman, Greenfield, Mass.

REVIEW OF THE JAPANESE BEETLE SITUATION, I. M. Hawley, Springfield, Mass.

NATURAL CONTROL OF INSECTS (10-minute papers)

1. Notes on Natural Enemies of Certain Orchard Pests, Philip Garman, New Haven, Conn.
2. Investigations on Parasites of Forest Insects by the Bureau of Entomology at New Haven, Conn., Philip B. Dowden, New Haven, Conn.
3. Parasitism of the Squash Bug by *Trichopoda pennipes*, Raimon L. Beard, New Haven, Conn.
4. Climatic Factors in Insect Control, Harvey L. Sweetman, Amherst, Mass.
5. Factors Important to a Successful Hibernation of the Corn Ear Worm, George W. Barber, New Haven, Conn.
6. Discussion

THE APPLE LEAF-CURLING MIDGE, W. D. Whitcomb, Waltham, Mass.

FERNALD COMMEMORATIVE EXERCISES

Address of Welcome, President Hugh P. Baker, Amherst, Mass.
Message from H. T. Fernald, Orlando, Florida.
A Tribute to Professor Charles H. Fernald, A. F. Burgess, Greenfield, Mass.
Professor C. H. Fernald and Fifty Years of Shade Tree Insect Control, E. P. Felt, Stamford, Conn.

CARPENTER ANT INJURY TO TELEPHONE POLES, R. B. Friend, New Haven, Conn.

FIELD PLOT EXPERIMENTS WITH CORN BORER INSECTICIDES, 1936, C. H. Batchelder and N. Turner, New Haven, Conn.

Insect Collection: Additions and Statistics

Important additions to the Station insect collection were made during the season. Messrs. Zappe, Turner and Plumb gathered flood debris in the early spring, and from this material obtained many insects. They also made several trips to various parts of the State with satisfactory results. Some unusual beetles were collected in the Japanese beetle traps. Mr. Harry L. Johnson of South Meriden has presented the Station with several small lots of insects that he collected, altogether about 500 specimens.

Mr. C. E. Jennings, who has been employed as entomologist on the WPA mosquito project, collected mosquito larvae from many localities and reared the adults, resulting in more than 1,600 specimens that fill 15 cigar boxes. Dr. B. J. Kaston has continued his work on borers and other insects affecting elm trees, and Dr. R. B. Friend and Mr. G. H. Plumb have made good progress in their studies of the insects infesting conifers. Several parasites have been reared from the borers of conifers and elms. More than 50 species of two-winged flies of the family Tipulidae, collected in Connecticut and new to the collection, were kindly donated by Professor Charles P. Alexander.

Doctor Kaston and others have collected more than 10,000 specimens of spiders, to be used in a study of the group for the Geological and Natural History Survey.

The insects collected and reared during the season amount to about 7,000 specimens. All have been mounted and labeled but some have not yet been identified.

The present statistics of the Station collection are as follows:

Order of insects	Number of named species and varieties	Type material species and varieties
Hymenoptera	1,275	129 types 12 paratypes
Diptera	938	
Lepidoptera	1,302	1 cotype
Coleoptera	2,258	1 type
Hemiptera		
Homoptera	522	1 type 5 cotypes
Heteroptera	405	45 paratypes
Odonata	129	
Orthoptera	104	
Neuroptera and other small orders	119	4 paratypes
Total	**7,052**	**198**

Of the species and varieties enumerated above, nearly all (probably 95 to 97 percent) are from Connecticut. There are also many other species (65 Chalcid flies) which have been identified only so far as the genus for each. Considering all specimens together with undetermined, duplicate and exhibit material, the Station collection probably contains more than 100,000 specimens. The cases holding these are shown in Figure 39.

Department Library: Additions and Statistics

The following important additions to the library have been made during the year: Berlese, Acari, Myriopoda et Scorpiones in Italia reperta, 101 fascicules, more than 1,000 pages, 963 plates, with supplements 1–4, 57 plates, and supplements 5 and 6 by F. Silvestri, 4 plates; Berlese, Gli Insetti, 2 vols., altogether 1,996 pages, 2,187 figures, 17 plates; Cecconia, Manuale di Entomologia Forestale, 680 pages, 786 figures; Schiner, Die Fliegen, 2 vols., altogether 1,332 pages; Meigen, European Diptera, with supplements, 10 vols., altogether 3,575 pages, 72 plates; Meigen, Klassifikazion und Beschreibung der Europaischen Zweiflugligen Insekten, 314 pages, 15 plates; Verrall, British Flies, 2 vols., altogether 1,471 pages, 805 figures; Weber, Biologie der Hemipteren, 543 pages, 32 figures; Selys-Longchamps, Odonata, 2 vols., altogether 1,011 pages, 37 plates; Seitz, Macrolepidoptera of the World, that portion containing the North American species of the Families Noctuidae, Geometridae and the Bombycine moths, altogether 964 pages, 123 plates and not completed; Genera Insectorum, fascicules 200–203, altogether 194 pages, 12 plates; Petrunkevitch, A Synonymic Index-Catalogue of Spiders of North, Central and South America, with index to generic names, by F. E. Lutz, 809 pages; Herrick, Insect Enemies of Shade Trees, 417 pages, 321 figures; Snyder, Our Enemy, the Termite, 196 pages, 56 figures; also many separates of Emerton's papers on spiders, and of various authors on insects.

FIGURE 39. Station insect collection cases at right and in background. Ends of library book stacks at left.

STATISTICS OF ENTOMOLOGICAL LIBRARY

Total number of bound volumes including journals, 1,474.

Total number of bulletins, pamphlets and separates, 6,019. In nearly all of the journals and in some of the separates the references to descriptions of new species have been placed in a card catalogue of about 20,000 cards, arranged alphabetically under each Order, convenient for ready reference.

INSPECTION OF NURSERIES, 1936

W. E. Britton and M. P. Zappe

Section 2136 of the General Statutes provides that all nurseries in Connecticut where stock is grown and offered for sale shall be inspected at least once each year. The annual inspection of these nurseries was commenced July 1 and was in charge of Mr. Zappe. As in preceding years, he was assisted during July and August by A. F. Clark, W. T. Rowe and R. J. Walker. By September 1 most of the larger nurseries had been inspected and Mr. Zappe completed the others September 20, with the help, in a few special cases, of Neely Turner, L. A. Devaux and W. E. Britton. Several nurseries were again visited one or more times to make sure that the pests had been eradicated.

On the whole the nurseries were in somewhat better condition than in 1935. Several had been sadly neglected. There was less European pine shoot moth than for the preceding three years, but more pine leaf scale and spruce aphid galls than ever found before. There were 26 nurseries in which no pests were found. Altogether, there were about 113 different insect pests, and 60 different plant diseases found in nurseries in 1936. These cannot all be mentioned here but some of the more important pests that may be carried on nursery stock are shown, with the number of nurseries infested by each for the past 10 years, in the following table:

Table 1. Ten-Year Record of Certain Nursery Pests

Pest	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
Oyster-shell scale	45	57	78	86	73	68	78	104	93	87
San José scale	16	30	22	8	11	10	13	19	17	11
Spruce gall aphids[1]	82	120	147	99	124	141	231	244	285	337
White pine weevil	17	19	37	66	74	70	61	67	98	82
Pine leaf scale	6	13	13	10	20	26	46	66	42	72
European pine shoot moth	1	7	7	17	32	77	137	120	121	108
Poplar canker	39	35	37	35	23	40	34	39	28	28
Pine blister rust	9	5	7	7	13	12	11	7	2	0
Nurseries uninfested	37	18	13	18	32	24	22	21	16	26
Number of nurseries	191	228	266	302	327	351	362	381	373	380

Number and Size of Nurseries

The list of nurserymen for 1936 contains 380 names, an increase of seven over 1935. A classification of nurseries by size may be indicated as follows:

Area	Number	Percentage
50 acres or more	18	5
10 acres to 49 acres	44	12
5 acres to 9 acres	32	8
2 acres to 4 acres	89	23
1 acre or less	197	52
	380	100

[1]Includes both *Adelges abietis* and *A. cooleyi*.

Of the 380 nurseries listed for 1936, seven new ones registered and were inspected before the spring shipping season and again in late summer. These are marked "(2)" after the name because each was inspected twice and granted two certificates during the year. One nurseryman failed to register before July 1, 1936, and, as provided in Section 2137 of the General Statutes, a minimum charge of $5.00 was made as the cost of inspection. This was collected and turned over to the treasurer of the Station to be paid to the State Treasurer.

The area of Connecticut nurseries receiving certificates in 1936 is 4,855 acres, an increase of 76 acres over 1935. Altogether 27 new names have been added, and 20 have discontinued the nursery business either temporarily or permanently, since last year. Some of these registered and some failed to register but most of them did not notify the office. Hence, it was necessary for the inspectors to visit the places before it was known that they had discontinued business. Twenty-two nurseries listed in 1935 are on the 1936 list under somewhat different names. The nursery list for 1936 contains 380 names, an increase of seven over that of last year. The nursery firms receiving certificates for 1936 are as follows:

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1936

Name of firm	Address	Acreage	Certificate date	Certificate number
Ackerman, H. S.	West Hartford	2	Sept. 24	3517
Adamcyk, Frank (2)	Deep River	1	Aug. 25	3360
Adamec Nursery, George	East Haven	1	Sept. 23	3509
Aldrich Gardens	Guilford	1	Sept. 23	3510
Aldrich, Miss Inie E.	Thomaston	2	Aug. 12	3312
Allara, Emanuel	Hamden	1	Nov. 21	3576
Allen, Henry L.	Pawcatuck	1	Aug. 10	3299
Amelunxen & DeWyn	Yalesville	4	Sept. 2	3400
Anderson Avenue Nursery	West Haven	1	Sept. 19	3494
Andover Gardens	Andover	1	Aug. 24	3346
Anstett Nursery, Louis	Norfolk	2	Sept. 29	3527
Arnold of Orange Nursery	Orange	1	Nov. 4	3560
Artistree Nursery	Branford	3	Oct. 2	3531
Austin, M. E.	Clinton	1	Aug. 25	3361
Baldwin, Linus	Middletown	1	Sept. 5	3421
Banak Nurseries	Rockville	2	July 17	3227
Barnes Bros. Nursery Co., The	Yalesville	215	Sept. 2	3401
Barrett Co., The W. E.	Manchester	10	Mar. 10	3211
Barrows, Paul M.	Stamford	1	Oct. 23	3550
Bartolotta, Mike S.	Cromwell	1	Sept. 8	3434
Barton Nursery	Hamden	1	Sept. 29	3525
Beach, Roy G.	Forestville	1	Aug. 14	3320
Beattie, William H.	New Haven	1	Sept. 8	3429
Bedford Gardens	Plainville	1	Sept. 22	3507
Beers, H. P.	Southport	1	Sept. 19	3497
Belltown Nurseries	Stamford	4	Oct. 5	3535
Benbow, Florist, Abram	Norfolk	1	Sept. 16	3481
Berkshire Gate Nurseries	Danbury	1	Aug. 7	3289
Bertolf Bros., Inc.	Old Greenwich	45	July 31	3272
Biehler, Augusta	Plainville	1	Sept. 10	3444
Blakeslee, Dwight W.	North Haven	1	May 2	3219
Blue Hills Nurseries, Inc.	Hartford	26	Aug. 27	3377
Boggini, Louis	South Manchester	1	Sept. 9	3441
Bonnie Brook Gardens	Rowayton	2	Nov. 12	3574
Booy, H. W.	Yalesville	4	Sept. 1	3399
Brack Nursery	Brookfield	1	Aug. 6	3282

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1936—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Brainard Nursery & Seed Co.	Thompsonville	14	Aug. 5	3279
Brandriff's Rock & Perennial Gardens	Branford	1	Sept. 11	3453
Branford Nurseries	Branford	6	Sept. 5	3419
Bretschneider, A.	Danielson	1	Aug. 20	3337
Bridgeport Hydraulic Co.	Bridgeport	15	Sept. 5	3425
Brimfield Gardens Nursery	Wethersfield	8	Aug. 25	3355
Bristol Nurseries, Inc.	Bristol	65	Aug. 18	3331
Brooklawn Nursery	Bridgeport	2	July 31	3270
Brooks the Florist	West Haven	1	Dec. 7	3593
Brouwer's Nurseries	New London	20	Aug. 24	3347
Brouwer's Nurseries, Peter	New London	3	Aug. 17	3330
Bulpitt, Henry F.	Darien	5	Aug. 29	3383
Bureau of Trees	New Haven	7	Sept. 14	3469
Burke the Florist	Rockville	1	July 21	3239
Burnett's Corners Farm, The	Mystic	2	Aug. 10	3296
Burr, Morris L.	Westport	1	Nov. 4	3559
Burr & Co., Inc., C. R.	Manchester	500	July 29	3264
Burwell Seed Co., E. E.	New Haven	1	Sept. 25	3518
Busch, A. H.	Greenwich	1	Aug. 14	3324
Byram Evergreen Nursery	East Port Chester	1	Sept. 1	3397
Cardarelli, E. J.	Cromwell	5	July 25	3252
Carlisle Hardware Co.	Manchester	6	Mar. 10	3214
Carlson's Garden Service	Tracy	1	Sept. 8	3431
Case, Mrs. Louis L.	Simsbury	1	Sept. 10	3447
Cherry Hill Nursery, Inc., The	Rockfall	20	Aug. 18	3332
Chesman, Joseph	East Haven	1	Sept. 11	3457
Chiapperini, Michele	Groton	1	Aug. 17	3327
Chippendale Nurseries, Inc.	Old Lyme	2	Sept. 22	3506
Choate School, The	Wallingford	4	Sept. 3	3407
City Line Florist	Bridgeport	1	Sept. 17	3486
Cleary's Gardens	Bethel	1	July 30	3268
Clinton Nurseries	Clinton	90	Oct. 26	3551
Clyne Nurseries	Waterbury	6	Dec. 4	3591
Coley, H. W.	Westport	1	Aug. 28	3380
Collington, E. H.	West Mystic	1	Aug. 24	3353
Conine Nursery Co., Inc.	Stratford	75	July 22	3247
Conn. Agr. Expt. Station (W. O. Filley, Forester)	New Haven	3	Sept. 14	3470
Connecticut Forestry Nurseries	Deep River	17	Nov. 9	3567
Conn. State College (S. P. Hollister)	Storrs	1	Aug. 15	3326
Conn. State Forestry Department	Hartford	5	Nov. 25	3583
Connecticut State Highway Dept. (Bureau of Roadside Development)	Hartford	18	Aug. 26	3368
Connecticut Valley Nurseries	Manchester	25	July 21	3241
Corrigan's West Haven Nurseries	West Haven	1	Sept. 11	3459
Cragholme Nurseries, Inc.	Greenwich	2	Aug. 27	3372
Cronamere Alpine Nurseries, Inc.	Greens Farms	3	Aug. 15	3325
Culver, W. B.	Suffield	1	Sept. 11	3454
Curtiss, C. F.	Plantsville	2	Oct. 30	3557
Daisy Hill Gardens	Derby	1	Aug. 27	3375
Dallas, Inc., Alexander	Waterbury	2	Sept. 21	3501
Damen, Peter J.	East Haven	2	Sept. 21	3503
Darien Nurseries	Darien	6	Aug. 8	3290
Daughters of Mary of the Immaculate Conception, Inc.	New Britain	1	Sept. 24	3516
Dawson, Florist, Wm. A.	Willimantic	1	Aug. 25	3358

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1936—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Daybreak Nurseries	Westport	3	Dec. 11	3594
Dearden Bros.	East Hartford	4	Sept. 3	3408
DeMars Nursery	Winsted	1	Sept. 19	3495
Devon Nursery	Devon	1	Sept. 26	3521
Dietrich Nursery, Benj.	Greenwich	4	Dec. 1	3586
Dillon, Thomas	Greenwich	1	Aug. 26	3364
Dingwall, Joseph N.	West Haven	1	Sept. 11	3460
Doane, David F.	Haddam	1	Sept. 18	3490
Doebeli, Charles A.	Bridgeport	1	Dec. 31	3597
Donovan, Dan H.	Talcottville	1	July 24	3251
Donovan, John N.	Rocky Hill	5	Aug. 29	3388
Dunlap's Dollar Evergreens	Cromwell	3	Aug. 6	3283
Dunn, James F.	Stamford	4	Dec. 1	3588
Eager, Edward M.	Bridgeport	1	July 15	3226
East Haven Nursery	East Haven	1	Sept. 15	3475
Edendale Gardens	Winsted	1	Oct. 1	3530
Edgewood Nurseries	New Haven	1	Aug. 29	3387
Elfgren Nurseries	East Killingly	3	Aug. 19	3336
Ellington Evergreen Nursery	Ellington	5	Nov. 12	3573
Ellsworth Nursery, The	Newington	1	Sept. 9	3440
Elm City Nurseries	New Haven	1	Sept. 11	3462
Elmgren Nursery	Cromwell	1	Dec. 31	3596
Elm Grove Cemetery Association	Mystic	1	Aug. 22	3343
Evergreen Nursery Co., The	Wilton	30	July 20	3237
Eyberse's Nursery	Norwich	1	Aug. 26	3365
Fairway Gardens	Woodmont	1	Sept. 4	3416
Farmington Valley Nursery	Avon	5	Oct. 17	3546
Fernhill Nursery	West Hartford	3	Aug. 26	3367
Fletcher, Walter G.	Guilford	5	Sept. 8	3426
Flower City Rose Company	Manchester	12	July 21	3242
Follett Nursery	Westport	10	Sept. 2	3402
Fountain Nurseries	Farmington	10	Sept. 15	3478
Fraser's Nurseries & Dahlia Gardens	Willimantic	3	Aug. 27	3373
Frede, Frederick	Danbury	1	Aug. 11	3310
Galligan, C. W.	New Haven	1	Nov. 16	3575
Gallup, Amos M.	Pawcatuck	1	Aug. 10	3298
Garden of Romance, The	Old Saybrook	2	Aug. 25	3354
Gardner's	Berlin	1	Sept. 21	3500
Gardner's Nurseries	Rocky Hill	250	Aug. 7	3286
Geduldig's Nursery	Norwich	6	Aug. 26	3366
Giant Valley Nursery	Mount Carmel	1	Sept. 15	3474
Gilbert, Henry G.	Danielson	2	Sept. 11	3455
Glastonbury Gardens	Glastonbury	4	Aug. 7	3287
Glenbrook Greenhouses	Glenbrook	2	Sept. 23	3511
Glen Terrace Nurseries	Hamden	60	Sept. 9	3442
Godfrey, Stratfield Nursery, George R.	Bridgeport	50	Sept. 18	3491
Golden Hill Nurseries	Shelton	3	Nov. 7	3564
Goodwin, James L. (2)	Hartford	1	Sept. 10	3448
Goodwin Nurseries	Bloomfield	7	Aug. 10	3307
Goshen Nurseries	Goshen	6	Oct. 8	3541
Gosnell, Evelyn	Westport	1	Aug. 6	3284
Green, Wm. P.	South Windsor	3	Sept. 9	3439
Green Acre Farms, Inc.	Waterford	1	Aug. 10	3293
Grillo, N.	Milldale	1	Sept. 4	3411
Griswold, George	Old Lyme	1	Aug. 14	3321
Gunn, Mrs. Charles	Kent	1	Sept. 30	3529

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1936—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Haas, Florist	Milford	1	Oct. 3	3533
Hall, Henry A. L.	West Haven	1	Sept. 11	3458
Hamden Nursery	Hamden	1	Sept. 15	3476
Hansen's, Florist & Nursery	Fairfield	5	Aug. 10	3308
Hansen's Perennial Garden	New Britain	2	May 22	3224
Happy Days Farm	Norwalk	10	Oct. 9	3542
Hearn, Thomas H.	Washington	3	Sept. 29	3526
Heath & Company	Manchester	15	July 17	3228
Henninger, Christ.	New Britain	1	Sept. 5	3423
Hettinger, Joseph O.	Manchester	1	Nov. 25	3582
Hildebrand's Nursery	Norwich	1	Aug. 19	3335
Hilding Brothers	Amston	1	Aug. 21	3340
Hillcrest Gardens	Woodbridge	3	Sept. 23	3512
Hilliard, H. J.	Sound View	1	Aug. 8	3292
Hinckley Hill Nursery	Stonington	1	Aug. 24	3348
Hiti Nurseries	Pomfret Center	11	Aug. 12	3314
Hofmann, Henry	Cromwell	1	Sept. 8	3427
Holcomb, Ernest L.	Granby	1	Sept. 10	3449
Holcomb's Evergreen Nursery	Winsted	4	Sept. 16	3482
Holdridge & Sons, S. E.	Norwich	3	Aug. 10	3301
Hope Street Nursery	Springdale	1	Sept. 17	3485
Horan, James F.	Hartford	1	Dec. 1	3585
Horan, Kieran W.	West Hartford	1	Sept. 2	3406
Horowitz, Ben	East Hampton	1	Aug. 10	3303
Hosking, James S.	Watertown	1	Sept. 25	3519
Hotchkiss, H. L.	North Haven	1	Sept. 18	3493
Houston's Nurseries	Mansfield Depot	13	Sept. 12	3463
Hoyt, Charles E.	Bethel	40	July 31	3269
Hoyt's Sons Co., Inc., Stephen	New Canaan	500	Aug. 5	3281
Hurlburt Nursery	Hamden	1	Sept. 8	3430
Isselee's Sons, Chas.	Darien	6	Oct. 15	3543
Jennings, Mrs. George S.	Southport	2	Oct. 5	3536
Johnson, Harry L.	South Meriden	1	Sept. 8	3432
Johnson, Tom	Stratford	1	Sept. 9	3437
Kateley, Milton M.	East River	1	Aug. 24	3362
Kauser, Alice	Norwalk	1	July 22	3246
Kelley & Son, James J.	New Canaan	6	Sept. 1	3394
Kellner, Arthur H.	Norwalk	1	Sept. 9	3436
Keogh, Harry W.	Norwalk	1	Dec. 15	3595
Keser's Sons, Inc., Otto	Portland	1	Sept. 21	3502
Key Rock Gardens	Newtown	2	July 30	3267
Lanedale Farm Nurseries	New Canaan	10	Aug. 29	3384
Langstroth Nurseries	Danbury	6	Aug. 13	3317
Laviola Nursery	New Haven	1	Nov. 5	3562
Lawrence Greenhouses	Branford	1	Sept. 8	3433
Leghorn's Evergreen Nurseries	Cromwell	27	July 24	3250
Lemmon, Robert S.	New Canaan	1	July 22	3245
Lewis Gardening Service	Kensington	1	Nov. 7	3565
Lewis & Valentine, Inc. (Construction Department)	Darien	9	Aug. 6	3285
Lowescroft Gardens	Manchester	1	July 17	3229
Luce, Mrs. Charles L. (2)	Newington	1	Sept. 10	3451
Luckey, Ada Mae	Greens Farms	1	Sept. 19	3496
Luckner, Jr., William	Stepney	1	Sept. 14	3466
Lynch, Mrs. John H.	Ridgefield	3	Sept. 1	3395
Malleable Iron Nursery	Branford	2	Nov. 7	3563
Maplewood Nursery Co.	Norwich	2	Nov. 23	3581
Marigold Farm Nursery	New Canaan	20	Aug. 29	3389

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1936—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Marlborough Gardens	Marlborough	1	Sept. 3	3409
Massacoe Nursery	Simsbury	1	Sept. 10	3446
Mather Homestead	Darien	1	Oct. 3	3534
McCarthy, John P.	Danbury	1	Aug. 11	3311
McConville's Greenhouses and Nurseries	Manchester	2	July 21	3240
Meier, A. R.	West Hartford	1	Nov. 5	3561
Melville Nurseries	Fairfield	1	Sept. 2	3403
Merwin Lane Nursery	East Norwalk	3	Sept. 26	3522
Meyer, Carl H. H.	Riverside	10	July 27	3253
Meyer Nursery, Ludwig	Bridgeport	4	Aug. 1	3275
Middeleer, Inc.	Darien	10	Sept. 10	3452
Milford Flower Gardens	Milford	1	Sept. 2	3404
Milford Nursery	Milford	2	July 23	3248
Miliano, S.	Woodmont	1	Sept. 29	3528
Millane Nurseries Co.	Cromwell	35	July 18	3234
Mill River Nursery	Fairfield	15	Aug. 14	3322
Millstone Gardens	Terryville	1	Aug. 1	3274
Minge, G. H.	Rocky Hill	1	Sept. 4	3410
Moraio Brothers	Old Greenwich	5	Aug. 26	3371
Morgan & Sons, Wm. F.	North Stonington	3	Aug. 10	3297
Mountain Farm Nursery	West Hartford	2	Sept. 15	3480
Mountain Grove Cemetery Association, The	Bridgeport	1	Sept. 2	3405
Mount Airy Gardens	Stamford	1	Nov. 21	3579
Mount Carmel Nursery	Mount Carmel	1	Sept. 9	3443
Munro, Charles	New Haven	1	Sept. 15	3473
New England Water Lily Gardens	Manchester	1	May 13	3222
New Haven Park Commission	New Haven	10	Sept. 11	3461
Newington Gardens & Nurseries	Newington Junction	1	Sept. 9	3435
New London Cemetery Association, The	New London	1	Aug. 25	3356
New London County Nurseries	New London	5	Aug. 31	3392
Newton's Nursery	West Granby	1	Sept. 19	3499
New York, New Haven & Hartford R. R. Co.	Bridgeport	4	Sept. 9	3438
Niantic Bouquet Shop	Niantic	1	Sept. 1	3398
North Avenue Nursery	Bridgeport	1	July 23	3249
North-Eastern Forestry Co., The	Cheshire	96	Aug. 10	3305
North Street Gardens	Milford	1	July 18	3230
Northville Gardens	New Milford	1	July 28	3262
Nyveldt, Albert	New London	1	Aug. 10	3304
Oakland Nurseries	Manchester	40	July 21	3243
Oldfield Nursery	Stratford	1	Sept. 18	3492
Old Orchard Nursery	Norwalk	4	Oct. 6	3538
Outpost Nurseries, Inc.	Ridgefield	750	Aug. 12	3315
Ouwerkerk, D. K.	Yalesville	10	Aug. 24	3349
Over-the-Garden-Wall	West Hartford	3	Aug. 10	3306
Oxoboxo Nursery	Montville	2	Aug. 14	3323
Ox Yoke Farm Nursery	Bridgeport	1	Nov. 10	3571
Ox Yoke Garden	Westport	2	Aug. 3	3276
Palmieri Florist & Nursery	New Haven	1	Oct. 28	3553
Park Place Nurseries	Marion	2	Sept. 19	3498
Partrick, O. F.	Sandy Hook	1	May 22	3223
Paton, William D.	Mount Carmel	1	Nov. 9	3568
Peatt, William T.	Ridgefield	1	Aug. 7	3288
Pedersen, Anthon	Stamford	3	Dec. 1	3587
Pendleton's Flower Gardens	Norwich	1	Aug. 8	3291
Pequot Florist, Andrew Beran	New London	1	Aug. 10	3300

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1936—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Peschko, Robert	Danbury	1	Aug. 17	3329
Pestretto, Frank	West Hartford	1	Aug. 26	3369
Pestretto, Salvatore	Hartford	1	Aug. 26	3370
Peterson's Flower Shop	West Hartford	1	Oct. 17	3547
Pflomm, Charles W.	Bridgeport	1	July 18	3235
Piemontese, Dominick	East Haven	1	Sept. 11	3456
Pierson, Inc., A. N.	Cromwell	250	July 15	3225
Pinatello, Angeline	East Hartford	4	Sept. 26	3524
Pinchbeck Bros., Inc.	Ridgefield	10	Aug. 28	3382
Pine Plains Greenhouse, Inc.	Norwich	2	Sept. 1	3396
Pomeroy Blue Spruce Gardens	New Milford	2	Aug. 1	3273
Prospect Nurseries, Inc.	Cromwell	25	Aug. 31	3391
Q Garden Farm	Milford	1	Oct. 5	3537
Quinebaug Forestry Co.	Stafford Springs	2	Sept. 23	3513
Rabe, Charles H.	Uncasville	4	Apr. 18	3217
Rabinak, Louis	Deep River	3	Aug. 29	3385
Race Brook Gardens, Inc.	Orange	1	Oct. 15	3545
Reliable Nursery, The	East Hartford	2	July 27	3255
Rengerman's Garden	Granby	1	Sept. 10	3450
Reveley, F. J.	Clinton	2	Sept. 22	3504
Reynold's Farms	South Norwalk	1	July 20	3238
Richmond, Gordon L.	New Milford	15	Aug. 13	3319
Ridgewood Nurseries	Milford	1	July 18	3231
Rockfall Nurseries, Ye Olde	Rockfall	45	Dec. 3	3589
Rolf, Mrs. Fred H.	Guilford	1	Nov. 30	3584
Rose Hill Nursery	Gildersleeve	3	Sept. 23	3514
"Rosery Rest, The"	Bridgeport	5	July 28	3259
Ross Bros. (2)	Manchester	10	Sept. 5	3420
Runacres Gardens	Madison	3	Nov. 21	3578
Russell St. Perennial Garden	South Manchester	1	July 18	3232
Sage Brothers	North Woodbury	1	Sept. 4	3414
Sakson's Nursery	Greenwich	1	Aug. 29	3386
Sandelli Greenhouses	New Britain	1	Nov. 12	3572
Sasco Hill Nursery	Southport	1	Aug. 25	3359
Saxe & Floto, Florists	Waterbury	1	Nov. 21	3580
Scarano Nursery, Alphonse	Groton	1	Aug. 22	3341
Schaeffer, Peter	Norwich	4	Aug. 24	3352
Schaghticoke Farm Nursery	Bridgewater	11	Oct. 2	3532
Schleichert Florist & Nursery	Bridgeport	1	July 30	3266
Schneider, Adolf	Milford	1	Sept. 14	3467
Schuller, John	Higganum	2	Sept. 5	3422
Schulze, Charles T.	Bethel	1	Dec. 3	3590
Schulze, Edward E.	Bethel	1	Aug. 17	3328
Scott's Nurseries	Bloomfield	10	Sept. 12	3464
Scotty's Nurseries	Woodbury	1	Sept. 4	3413
Sears Roebuck & Co. (2)	Manchester	10	Aug. 18	3333
Selleck, Joel F.	Nichols	1	Oct. 21	3549
Seltsam's Pequonnock Gardens	Bridgeport	1	Sept. 5	3417
Seymour Gardens, Prudence	New Milford	1	July 28	3263
Seymour's Hemlock Nursery	Riverton	1	Sept. 16	3483
Sharon Valley Nursery	Sharon	1	July 18	3233
Silver City Nursery	Meriden	5	Sept. 15	3479
Simonsen, H. C.	Plainville	3	Sept. 10	3445
Sipocz Arrowhead Farm	Fairfield	1	July 31	3271
Smith & Son, Edward A.	Mystic	1	Aug. 10	3294
Soltes Nursery, M. J.	Shelton	2	Sept. 22	3508
Southport Nursery	Southport	35	Aug. 25	3357
South Wilton Nurseries	Wilton	5	Aug. 4	3277
Springdale Florist, The	Springdale	1	Nov. 10	3569

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1936—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Spring Nurseries	Forestville	1	Aug. 21	3338
Stack, Garrett M.	Guilford	1	Oct. 29	3554
Stafford Conservatories	Stafford Springs	1	July 27	3256
Stalzer & Son, John	Brooklyn	1	Aug. 10	3302
Stannard, Julia	Wilton	1	Sept. 17	3489
State Street Nursery	Hamden	2	Sept. 15	3472
Steck Nursery	Bethel	4	Oct. 27	3552
Steck, Sarah B.	Bethel	1	Aug. 12	3313
Steck & Sons, Inc., Charles A.	Newtown	20	Sept. 22	3505
Steele's Nurseries, Charles	Greenwich	2	Aug. 27	3374
Stefani, Walter	Southington	25	Sept. 4	3415
Stocking, Milton C. (2)	Simsbury	1	Oct. 6	3539
Strayer, Paul	Stratford	1	July 20	3236
Sunridge Nurseries	Greenwich	75	Sept. 5	3424
Swendson, Hans	Cheshire	1	Oct. 30	3558
Sylvan Greenhouse & Nursery	Bridgeport	2	July 27	3254
Thomas & Sons, Inc., W. D.	Hamden	1	Aug. 24	3350
Thomson Co., W. W.	West Hartford	4	Oct. 19	3548
Torizzo, P. A.	West Hartford	5	Aug. 31	3393
Tower Crispette Co.	Guilford	1	Oct. 29	3555
Tow Path Gardens	Hartford	15	Aug. 28	3379
Tracy, B. Hammond	Yalesville	1	Aug. 24	3351
Triangle Nursery	Yalesville	2	Sept. 8	3428
Twin Pines Gardens, The	New Milford	1	July 28	3261
Uplands Flower Gardens	Woodbury	1	Sept. 4	3412
Valley View Nursery	Southington	1	Nov. 21	3577
Van der Bom, F.	Bethel	5	Aug. 28	3381
Vanderbrook & Son, C. L.	Manchester	63	July 29	3265
Van Wilgen Nurseries	Branford	22	Oct. 8	3540
Van Wilgen, William	Branford	1	Sept. 5	3418
Vasileff Nurseries	Greenwich	4	Aug. 27	3378
Verkade's Nurseries	New London	60	Aug. 19	3334
Vernick's Nurseries, John H.	Bridgeport	2	Aug. 4	3278
Wallace Nursery	Wallingford	5	Aug. 21	3339
Wallingford Nurseries of the Barnes Nursery & Orchard Co.	Wallingford	60	Oct. 15	3544
Waltermire, Wm. H.	Guilford	1	Oct. 28	3556
Ward & Son, John F.	Windsor	1	Aug. 13	3318
Watertown Nurseries, Inc.	Watertown	1	Sept. 16	3484
Weinberger, William	Ridgefield	2	Aug. 22	3344
Westerly Nursery	Pawcatuck	2	Aug. 22	3342
Westover Nurseries	Stamford	1	July 28	3258
West Street Nursery Co. (2)	Danbury	1	Aug. 11	3309
Westville Nurseries	New Haven	3	Dec. 5	3592
Wethersfield Nursery	Wethersfield	2	Aug. 25	3363
Wheeler, Charles B.	Stonington	1	Aug. 10	3295
Whittemore Co., J. H.	Naugatuck	3	Sept. 15	3477
Wild Flower Nursery	Brookfield	1	July 28	3260
Wild's Nursery, Henry	Norwalk	30	Aug. 22	3345
Willow Gardens	Darien	1	Aug. 13	3316
Wilridge Nurseries	Ridgefield	5	Aug. 5	3280
Wilson Landscape Co., The	Hartford	1	Nov. 10	3570
Wilson, Michael L.	Litchfield	5	Sept. 26	3523
Wilson & Co., Inc., C. E.	Manchester	125	July 28	3257
Woodbridge Nurseries	New Haven	4	Sept. 14	3471
Woodcrythe (E.H. & W.S. Sloan)	New Canaan	1	July 22	3244
Woodmont Gardens	Woodmont	1	Aug. 27	3376
Woodmont Nurseries	Woodmont	110	Sept. 17	3488

CONNECTICUT NURSERY FIRMS CERTIFIED IN 1936—(*Continued*)

Name of firm	Address	Acreage	Certificate date	Certificate number
Woodruff, C. V.	Orange	2	Aug. 29	3390
Wyllie, David	North Haven	1	Sept. 14	3468
Yacko, Stephen	Clinton	2	Sept. 23	3515
Yale University Forest School Nursery	New Haven	1	Sept. 17	3487
Yale University Landscape Department	New Haven	8	Sept. 12	3465
Young's Nurseries	Wilton	2	Sept. 25	3520
Zack Co., H. J.	Deep River	10	Nov. 9	3566
Total	**380 nurseries**	**4,855 acres**		

The cost of inspecting these nurseries in 1936, including certain additional visits to make sure that pests had been eradicated, was approximately $1,710.02.

Other Kinds of Certificates Issued

During 1936, 175 duplicate certificates were issued to Connecticut nurserymen, to be filed in other states. Altogether, 106 dealer's permits were issued to registered dealers who do not grow the nursery stock that they sell. Shipper's permits to the number of 214 were issued to nurserymen in other states who wish to ship stock into Connecticut. Also, 1,357 parcels of nursery stock were inspected and certified for shipment to accommodate individuals.

There were also issued 179 miscellaneous certificates and special permits, 161 blister rust control area permits, 1,214 corn borer certificates and 1,026 certificates for packages of shelled corn and other seeds, many of which were consigned to foreign countries.

Inspection of Imported Nursery Stock

Less nursery stock entered Connecticut from foreign countries in 1935-1936 than for several years. Both number of shipments and number of plants were smaller. As in other years, this stock entered the United States under regulations and permits of the Federal Bureau of Entomology and Plant Quarantine, and at ports of entry was released for transit to destination points, where it was examined by state inspectors.

In 1935-1936 there were 13 shipments, containing 72 separate cases, and 527,950 plants, all of which were rose stocks, and all were inspected by Mr. Zappe. This stock was imported by four commercial rose growers: Two growers received 405,000 and 55,400 plants respectively, each in five shipments; one received 30,000 plants in two shipments, and one received 37,550 plants in one shipment. This stock came from the following sources:

Country	No. shipments	No. plants
Holland	12	502,950
England	1	25,000
Total	13	527,950

This stock consisted of *Rosa manetti*, 490,400 and *Rosa multiflora*, 37,550 plants.

The time required to inspect this imported rose stock was equivalent to eight days of work for one man, and together with the cost of travel (560 miles) and other necessary expenses, made a total cost of approximately $102.15. Reports of the 13 shipments inspected were sent to the Federal Bureau of Entomology and Plant Quarantine.

Results of Inspection

Of the 13 shipments inspected, two shipments, or 15.38 percent, were found infested with insects, *Emphytus cinctus* Linn.

In addition to the rose stocks mentioned above, there were six shipments containing 118 dahlia tubers, one shipment containing 28 iris rootstocks, 29 shipments containing 1,387 pounds of shrub and tree seeds, 300 separate palm seeds, 54 orchids, 30 peony, 50 Korean boxwood, 24 *Meconopsis baileyi*, 20 anemone, 15 primula, 30 lily bulbs, 8 dwarf maples, 400 cactus, 50 azalea, 100 Hedera, 60 hydrangea and 98 rose plants, that were not inspected in Connecticut.

INSPECTION OF APIARIES, 1936

W. E. Britton

As in former years, the apiaries have been inspected by two inspectors, Mr. H. W. Coley of Westport, covering the four southern counties of Fairfield, New Haven, Middlesex and New London, and Mr. W. H. Kelsey of Bristol, covering the four northern counties of Litchfield, Hartford, Tolland and Windham. Most of this work is done in warm weather, beginning in May and ending in October. However, in 1936 a few inspections were made in March, where colonies of bees had died and were suspected of having died from the American foul brood. It was feared that bees might rob the honey stores from the hives and thus carry the disease to healthy apiaries. Such hives were destroyed, disinfected, or closed to prevent the access of bees. Sixty-one apiaries were inspected twice, and one apiary four times.

Altogether, 1,438 apiaries containing 9,278 colonies, were inspected in 1936 as against 1,333 apiaries and 8,855 colonies in 1935. Only one colony was found infected with European foul brood, and 176 colonies in 89 apiaries were infected with American foul brood in 1936, as against no European foul brood and 84 apiaries and 209 colonies with American foul brood in 1935. As in 1935, this disease was more prevalent in Hartford and Litchfield counties than elsewhere, but occurred in every county in the State.

The total cost of inspecting these apiaries in 1936 was $2,056.22, of which $747.86 was from the balance of the appropriation for the fiscal year ending June 30, 1936, and $1,308.36 from the appropriation of the present fiscal year, available July 1, 1936.

Table 2. Twenty-Seven Year Record of Apiary Inspection in Connecticut

Year	Number apiaries	Number colonies	Average No. colonies per apiary	Average cost of inspection Per apiary	Per colony
1910	208	1,595	7.6	$2.40	.28
1911	162	1,571	9.7	1.99	.21
1912	153	1,431	9.3	1.96	.21
1913	189	1,500	7.9	1.63	.21
1914	463	3,882	8.38	1.62	.19
1915	494	4,241	8.58	1.51	.175
1916	467	3,898	8.34	1.61	.19
1917	473	4,506	9.52	1.58	.166
1918	395	3,047	7.8	1.97	.25
1919	723	6,070	11.2	2.45	.29
1920	762	4,797	6.5	2.565	.41
1921	751	6,972	9.2	2.638	.24
1922	797	8,007	10.04	2.60	.257
1923	725	6,802	9.38	2.55	.27
1924	953	8,929	9.4	2.42	.25
1925	766	8,257	10.7	2.45	.22
1926	814	7,923	9.7	2.35	.24
1927	803	8,133	10.1	2.37	.234
1928	852	8,023	9.41	2.12	.225
1929	990	9,559	9.55	2.19	.227
1930	1,059	10,335	9.76	2.01	.206
1931	1,232	10,678	8.66	1.83	.212
1932	1,397	11,459	8.2	1.60	.195
1933	1,342	10,927	8.1	1.69	.208
1934	1,429	7,128	4.98	1.40	.28
1935	1,333	8,855	6.64	1.556	.234
1936	1,438	9,278	6.45	1.429	.221

Table 2 shows the number of apiaries and colonies inspected, the average number of colonies per apiary, and the average cost of inspecting each apiary and colony for each year since inspection began in 1910.

In 1936, apiaries were inspected in 159 towns. Inspections were made in the following 18 towns not visited in 1935:

Fairfield County: Newtown, Weston; *New Haven County:* Beacon Falls, Derby, Prospect, Wolcott, Woodbridge; *New London County:* Old Lyme; *Litchfield County:* Cornwall; *Tolland County:* Andover, Bolton, Columbia, Coventry; *Windham County:* Canterbury, Pomfret, Scotland, Sterling, Windham.

On the other hand, in the following eight towns visited in 1935, no inspections were made in 1936:

New Haven County: Madison, West Haven; *Tolland County:* Somers, Stafford, Willington; *Windham County:* Brooklyn, Chaplin, Hampton.

There were four apiaries infected with sacbrood and 89 apiaries infected with American foul brood.

In 1936, American foul brood was discovered in the following 41 towns: *Fairfield County:* New Canaan, Westport; *New Haven County:* Cheshire, Hamden, Meriden, Wallingford; *Middlesex County:* Middlefield, Portland; *New London County:* Ledyard, Norwich, Sprague, Stonington; *Litchfield County:* Bethlehem, Colebrook, Litchfield, Morris, Plymouth, Sharon, Thomaston, Torrington, Warren, Washington, Watertown, Winchester, Woodbury; *Hartford County:* Berlin, Bloomfield, Bristol, Burlington, Canton, Farmington, Hartford, Manchester, New Britain, Newington, Rocky Hill, Southington, West Hartford, Windsor; *Tolland County:* Mansfield; *Windham County:* Windham.

Statistics of Inspection

The statistics of apiary inspection by towns and counties are shown on the following pages, with summary on page 329.

INSPECTION OF APIARIES, 1936

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
Fairfield County				
Bethel	4	—	17	—
Bridgeport	3	—	15	—
Brookfield	2	—	6	—
Danbury	11	—	91	—
Darien	1	—	29	—
Easton	4	—	19	—
Fairfield	8	—	71	—
Greenwich	9	—	109	—
Monroe	9	—	61	—
New Canaan	4	1	35	1
New Fairfield	10	—	74	—
Newtown	5	—	53	—
Norwalk	2	—	11	—
Redding	1	—	6	—
Ridgefield	4	—	55	—
Shelton	2	—	38	—
Sherman	4	—	24	—
Stamford	4	—	33	—
Stratford	7	—	74	—
Trumbull	5	—	34	—
Weston	1	—	85	—
Westport	9	1	98	7
Wilton	3	—	40	—
	112	2	1,078	8

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
New Haven County				
Ansonia	2	—	17	—
Beacon Falls	1	—	15	—
Branford	3	—	22	—
Cheshire	5	2	46	2
Derby	2	—	14	—
East Haven	3	—	54	—
Guilford	1	—	24	—
Hamden	13	4	58	8
Meriden[1]	18	4	143	9
Middlebury	1	—	9	—
Milford	3	—	32	—
Naugatuck	4	—	31	—
New Haven	1	—	4	—
North Branford	3	—	59	—
North Haven	3	—	30	—
Orange	5	—	59	—
Oxford	7	—	58	—
Prospect	1	—	5	—
Seymour	6	—	51	—
Southbury	3	—	139	—
Wallingford[2]	10	1	152	2
Waterbury	4	—	9	—
Wolcott	3	—	15	—
Woodbridge[3]	4	—	27	—
	106	11	1,073	21
Middlesex County				
Chester	4	—	24	—
Clinton	2	—	12	—
Cromwell	10	—	59	—
Durham	5	—	69	—
East Haddam	7	—	69	—
East Hampton	13	—	119	—
Essex	9	—	35	—
Haddam	5	—	39	—
Killingworth	2	—	12	—
Middlefield[1]	6	1	128	2
Middletown	15	—	91	—
Old Saybrook[4,5]	15	—	52	—
Portland[1]	11	1	52	1
Saybrook	4	—	36	—
Westbrook	1	—	12	—
	109	2	809	3
New London County				
Bozrah	1	—	61	—
Colchester[1]	12	—	91	—
East Lyme	9	—	110	—
Franklin	3	—	67	—
Griswold	4	—	73	—
Groton	14	—	88	—
Lebanon	8	—	104	—
Ledyard[1]	9	2	139	8

[1]One apiary inspected twice.
[2]Two apiaries inspected twice.
[3]Three colonies with sacbrood.
[4]Three apiaries inspected twice.
[5]One colony infested with European fou lbrood.

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
New London County—Continued				
Lisbon	1	—	16	—
Lyme	6	—	78	—
Montville	4	—	25	—
New London	4	—	21	—
North Stonington	4	—	24	—
Norwich[6]	5	1	70	1
Old Lyme	2	—	6	—
Preston	7	—	61	—
Salem	4	—	60	—
Sprague	4	1	52	5
Stonington	17	1	77	
Voluntown	1	—	7	—
Waterford	15	—	136	—
	134	5	1,366	18
Litchfield County				
Barkhamsted	6	—	19	—
Bethlehem[4]	10	3	108	8
Bridgewater	6	—	57	—
Canaan	2	—	9	—
Colebrook[1]	11	2	101	5
Cornwall	7	—	33	—
Goshen	12	—	41	—
Harwinton	8	—	30	—
Kent	7	—	55	—
Litchfield[2]	20	3	121	8
Morris[1]	8	2	19	2
New Hartford	11	—	43	—
New Milford	28	—	169	—
Norfolk	5	—	12	—
North Canaan[1]	8	—	71	—
Plymouth[2]	15	3	94	4
Roxbury[1]	9	—	29	—
Salisbury	12	—	40	—
Sharon	16	1	170	1
Thomaston[1]	10	3	68	3
Torrington[1]	23	2	85	2
Warren[1]	8	2	35	2
Washington[7]	20	3	59	3
Watertown[2]	21	2	130	2
Winchester[1]	12	2	58	3
Woodbury[2]	11	2	68	5
	306	30	1,724	48
Hartford County				
Avon	10	—	37	—
Berlin[8,9]	29	5	154	10
Bloomfield	19	1	148	1
Bristol[1]	16	1	87	2
Burlington[1]	8	1	49	1
Canton[1]	13	3	69	6

[4]Three apiaries inspected twice.
[1]One apiary inspected twice.
[2]Two apiaries inspected twice.
[6]One apiary inspected four times.
[7]Five apiaries inspected twice.
[8]Four apiaries inspected twice.
[9]One colony with sacbrood.

Town	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am. f. b.)
Hartford County—Continued				
East Granby	11	—	29	—
East Hartford	22	—	107	—
East Windsor	12	—	69	—
Enfield	9	—	63	—
Farmington[9]	17	1	63	1
Glastonbury	23	—	106	—
Granby	16	—	73	—
Hartford[2]	13	2	67	2
Hartland	3	—	15	—
Manchester[1,10]	15	1	63	3
Marlborough	2	—	29	—
New Britain[1]	29	1	157	6
Newington[11]	25	7	99	16
Plainville	9	—	31	—
Rocky Hill	6	1	36	9
Simsbury	13	—	61	—
Southington[7]	32	7	214	10
South Windsor	14	—	69	—
Suffield	14	—	82	—
West Hartford[1]	26	1	121	1
Wethersfield	17	—	61	—
Windsor	22	2	91	3
Windsor Locks	4	—	39	—
	449	34	2,289	71
Tolland County				
Andover	3	—	5	—
Bolton	2	—	9	—
Columbia	9	—	55	—
Coventry	19	—	78	—
Ellington	13	—	55	—
Hebron	7	—	42	—
Mansfield	17	2	54	4
Tolland	12	—	39	—
Vernon	13	—	74	—
	95	2	411	4
Windham County				
Ashford	8	—	22	—
Canterbury	4	—	24	—
Eastford	4	—	13	—
Killingly	7	—	23	—
Plainfield[2]	19	—	96	—
Pomfret	13	—	74	—
Putnam	4	—	25	—
Scotland	10	—	36	—
Sterling	3	—	3	—
Thompson	17	—	80	—
Windham[2]	19	3	54	3
Woodstock	19	—	78	—
	127	3	528	3

[9]One colony with sacbrood.
[2]Two apiaries inspected twice.
[1]One apiary inspected twice.
[10]Two colonies with sacbrood.
[11]Six apiaries inspected twice.
[7]Five apiaries inspected twice.

SUMMARY

County	Number towns	Apiaries Inspected	Apiaries Diseased (Am. f. b.)	Colonies Inspected	Colonies Diseased (Am f. b.)
Fairfield	23	112	2	1,078	8
New Haven[1,2]	24	106	11	1,073	21
Middlesex[1,3]	15	109	2	809	3
New London[1,4]	21	134	5	1 366	18
Litchfield[1]	26	306	30	1,724	48
Hartford[1,2]	29	449	34	2,289	71
Tolland	9	95	2	411	4
Windham[1]	12	127	3	528	3
	159	1,438	89	9,278	176

	Number apiaries	Number colonies
Inspected, 1936	1,438	9,278
Infested with American foul brood	89	176
Percentage infested	.061	.019
Colonies treated		36
Colonies destroyed		140
Infested with European foul brood		1
Average number of colonies per apiary		6.45
Cost of inspection for 1936	$2,056.22	
Average cost	1.43 per apiary	.221 per colony

Financial Statement

July 1, 1935—June 30, 1936

RECEIPTS

Appropriation year ending June 30, 1936	$1,999.00

DISBURSEMENTS

Salaries	$ 950.40
Travel expense (outlying investigations)	1,039.43
Miscellaneous supplies	8.73
Total Disbursements	$1,998.56
Balance on hand July 1, 1936	.44*
	$1,999.00

July 1, 1936—December 31, 1936

RECEIPTS

Appropriation year ending June 30, 1937	$1,999.00

DISBURSEMENTS

Salaries	$628.86	
Travel expense (outlying investigations)	650.50	
Medical services	29.00	
Total		$1,308.36
Balance on hand January 1, 1937		$ 690.64

[1]New Haven County, three apiaries inspected twice; Middlesex County, five apiaries inspected twice; New London County, two apiaries inspected twice; Litchfield County, 24 apiaries inspected twice; Hartford County, 23 apiaries inspected twice; Windham County, four apiaries inspected twice.

[2]New Haven County, three colonies with sacbrood; Hartford County, four colonies with sacbrood.

[3]One colony with European foul brood.

[4]One apiary inspected four times.

*Reverts to State Treasury.

Registration of Bees

Section 2129 of the General Statutes provides that each beekeeper shall register his bees on or before October 1 of each year with the town clerk of the town in which the bees are kept, and that each town clerk, on or before December 1, shall report to the State Entomologist whether or not any bees have been registered, and if so, shall send a list of the names and number of colonies belonging to each. In 1936, 1,438 apiaries containing 9,278 colonies were inspected. There were registered 758 apiaries and 4,931 colonies in 1936, and after checking the registrations and inspections, and deducting the duplications, the following figures show that at least this number of apiaries and colonies were kept in Connecticut in 1936:

	Apiaries	Colonies
Inspected	1,438	9,278
Registered but not inspected	333	1,539
Total	1,771	10,817

REPORT ON CONTROL OF THE GYPSY MOTH, 1936

W. E. Britton, J. T. Ashworth and O. B. Cooke

As for several years, the gypsy moth control work for the scouting season of 1935-1936 has been conducted by the regular state force, in immediate charge of Mr. Ashworth, in coöperation with the Federal Bureau of Entomology and Plant Quarantine. Most of the Federal activities have been directed toward the control of the insect in the western portion of the infested area in order to prevent its westward spread. The work of the state organization was all performed in Hartford, New London, Tolland and Windham counties, and nearly all of it was east of the Connecticut River. Considerable help was received from men from various CCC camps, detailed for gypsy moth work, and from men furnished for creosoting egg-clusters and cutting brush through funds allotted by the Works Progress Administration.

Scouting by regular state employees was greatly curtailed during the season because these trained men were needed to supervise the work of the WPA and CCC men, who for the most part were inexperienced in gypsy moth control operations. Inasmuch as the trained Federal men in Connecticut were used solely to supervise WPA workers, this report will not contain any description of conditions found in the territory which they covered, but the results obtained by them are included in the statistics on pages 333 to 337.

For the satisfactory coöperation always received, the writers here express their gratitude and thanks to the following persons: Mr. A. F. Burgess, who has general supervision of Gypsy and Brown-tail Moth Control for the Bureau of Entomology and Plant Quarantine; Mr. H. L. Blaisdell, in charge of field work, under Mr. Burgess; Mr. S. S. Crossman, under whose direction gypsy moth control work was carried on in the various CCC camps, in the central and western parts of Connecticut; and to Mr. A. F. Hawes, State Forester, who has general supervision of the CCC camps.

New Equipment

During the spring of the year, 500 feet of spray hose and 50 feet of suction hose were purchased to replace like amounts that had worn out. The 1931 Buick sedan, used on this work, had been driven approximately 105,000 miles and was replaced by another Buick sedan, Model 36/41, purchased in January, 1936. Three of the 1931 Ford Model A, light delivery trucks had been driven to such an extent that it was considered advisable to replace them rather than to make further repairs. This was done in June, 1936, and three Chevrolet Canopy trucks with closed cabs, 1936 Master models, were purchased. A new steel, three drawer, filing cabinet with index guides was obtained to replace some old letter files that were becoming unusable.

Sundry wrenches and other small tools were purchased during the year to replace others that had worn out.

Control Operations

The following is a brief report of gypsy moth control operations for the year, by the different agencies.

WORK PERFORMED BY STATE MEN

The regular state gypsy moth crews operated in Hartford, New London, Tolland and Windham counties.

Hartford County: The towns of Bloomfield and West Hartford were visited by a crew during the larval season, and caterpillars were found at points visited in both towns.

New London County: During the season, state employees worked in the following towns: Colchester, Groton, Lebanon, Ledyard, New London, North Stonington, Norwich, Preston, Salem, Stonington and Waterford. Scouting work in Colchester, Lebanon and Waterford revealed infestations in Colchester and Lebanon. The other towns mentioned were visited during the larval season and caterpillars were found in all of them except Salem. During June, infestations were sprayed in Colchester, Lebanon and Stonington.

Tolland County: Scouting work was performed in the towns of Bolton, Coventry and Hebron during the year. The towns of Andover, Columbia, Coventry, Ellington, Hebron, Tolland and Willington were visited during the larval season and caterpillars were found in each. Infestations in Bolton and Coventry were sprayed.

Windham County: Gypsy moth control work was performed in the towns of Ashford, Brooklyn, Killingly, Putnam and Woodstock, during the past season. Scouting work in Killingly and Woodstock, and visits to Ashford, Brooklyn, Killingly and Putnam during the larval season showed that caterpillars were present in all these points.

During the course of the year, state men destroyed 26,401 egg-clusters, crushed 60,673 larvae and pupae, scouted 321 miles of roadside and 300 acres of woodland. During the spraying season 10,257 pounds of arsenate of lead were used during the operations.

WORK PERFORMED BY CCC MEN

During the year extensive gypsy moth control work was carried on by details of men from the various CCC camps throughout the State. These men worked in 59 towns in Windham, New London, Tolland, Middlesex, Hartford, New Haven and Litchfield counties. They creosoted 156,877 egg-clusters, crushed 2,521,905 larvae and pupae, scouted 1,913 miles of roadside and 498,544 acres of wooded and open country. In lieu of spraying, they banded a large number of trees with burlap. At gypsy moth infestations, most of the trees in and around the infested areas were banded just before the larvae emerged and daily patrols during the larval season removed and crushed all larvae and pupae within the bands. There were approximately 833,686 bands applied throughout the State. The work performed by CCC men from the camps in eastern Connecticut, established in the towns of Union, Hampton, Voluntown and Colchester, was under the supervision of men from the regular state gypsy moth force.

WPA WORK PERFORMED

Through an allotment granted by the Works Progress Administration, it was possible to hire a number of men for gypsy moth suppression work. Most of these men came from the relief rolls of the various towns in the State in the locality from which they were requisitioned. This project was administered from the Greenfield office of the Bureau of Entomology and Plant Quarantine. It was carried on in all counties of the State, except Windham, and during the course of the season consisted of scouting, clean-up and spray work in 49 towns. Considerable woodland scouting was done by these men, and approximately 286,660 acres of wooded and open country were examined by this method, during the year. Through their efforts, 540 acres of woodland were cleaned of brush and decayed and fallen timber, and 179,493 egg-clusters were found and creosoted. These men also applied 80,942 bands of burlap to trees in and around infested areas throughout the State, which resulted in the destruction of 199,982 larvae and pupae. All WPA work in Connecticut, east of the Connecticut River, was supervised by the regular state men.

RESETTLEMENT ADMINISTRATION PROJECT

In April, 1936, gypsy moth scouting was carried on by the Resettlement Administration, on its own property in the town of Griswold. During the life of the project, the scouting crew inspected 35 acres of woodland and found and creosoted 1,920 egg-clusters. Mr. Ashworth supervised the work.

QUARANTINES

There have been no changes in the regulated area in Connecticut during the past year.

The following pages show the statistics of gypsy moth suppression work performed by all three agencies, with a summary on page 337.

Statistics of Infestations, 1935–1936

Towns	Infestations found	Egg-clusters creosoted	Number colonies sprayed	Lbs. lead used	Larvae, pupae crushed	Bands applied	Miles scouted	Acres scouted	Acres cleaned
Windham County									
Ashford[1]	0	0	0	0	467	30	0	0	0
Brooklyn[1]	0	0	0	0	4,468	0	0	0	0
Eastford[2]	7	802	0	0	43,948	354	1	1,705	0
Killingly[1]	4	3,564	1	648	3,905	0	11	14	0
Pomfret[2]	4	92,826	0	0	1,053,500	4,697	0	3,235	0
Putnam[1]	0	0	0	0	3,563	0	0	0	0
Woodstock[4]	7	12,647	0	0	71,154	490	12	248	0
	22	109,839	1	648	1,181,005	5,571	24	5,202	0
New London County									
Colchester[4]	10	2,259	5	630	5,621	8,895	144	206	16
East Lyme[6]	1	2,667	0	0	7,260	17,587	4	663	0
Griswold[7]	9	1,920	0	0	0	0	0	35	0
Groton[5]	1	929	0	0	3,097	1,013	0	14	0
Lebanon[5]	11	88,876	1	84	14,493	2,785	99	240	0
Ledyard[1]	0	0	0	0	2,078	0	0	0	0
New London[1]	0	0	0	0	2,645	0	0	0	0
North Stonington[1]	0	0	0	0	359	0	0	0	0
Norwich[1]	2	45	0	0	79	0	0	0	0
Preston[1]	0	0	0	0	23	0	0	0	0
Salem[1]	0	0	0	0	0	0	0	0	0
Stonington[5]	6	29,316	4	4,662	29,636	2,895	0	455	163
Voluntown[2]	15	3,901	0	0	1,455	890	0	15,353	0
Waterford[1]	0	0	0	0	11	0	0	0	0
	55	129,913	10	5,376	66,757	34,065	247	16,966	179
Tolland County									
Andover[1]	0	0	0	0	1,767	0	0	0	0
Bolton[1]	3	96	2	468	239	0	1	54	0
Columbia[5]	1	21,818	0	0	39,419	2,086	0	30	5

Foot notes after summary.

Towns	Infestations found	Egg-clusters creosoted	Number colonies sprayed	Lbs. lead used	Larvae, pupae crushed	Bands applied	Miles scouted	Acres scouted	Acres cleaned
Tolland County (*Continued*)									
Coventry[5]	30	17,292	12	3,765	1,041	0	103	472	0
Ellington[4]	27	462	0	0	2,847	18,523	94	22,146	284
Hebron[1]	9	1,936	0	0	602	0	56	66	0
Mansfield[3]	2	8,007	0	0	13,830	2,209	0	155	0
Somers[2]	22	1,171	0	0	3,476	16,568	14	3,595	145
Stafford[3]	35	25,403	0	0	424,549	5,860	26	2,193	69
Tolland[1]	0	0	0	0	14	0	0	0	0
Union[2]	17	15,850	0	0	74,503	1,462	0	2,986	6
Vernon[2]	0	0	0	0	0	0	0	2	2
Willington	0	0	0	0	3,068	0	0	0	0
	146	92,035	14	4,233	565,355	46,708	294	31,699	511
Middlesex County									
Durham[6]	1	179	1	1,995	10,021	16,728	5	1,682	13
East Haddam[2]	0	0	0	0	0	0	11	4,650	0
East Hampton[2]	0	0	0	0	0	0	6	1,900	0
Essex[2]	0	0	0	0	0	0	26	7,635	0
Haddam[2]	1	62	0	0	1,822	16,570	40	11,511	2
Killingworth[2]	0	0	0	0	0	0	36	16,550	0
Middlefield[2]	5	18	0	0	526	10,160	17	7,419	16
Middletown[6]	2	1,335	0	0	13,261	63,769	2	575	46
Old Saybrook[2]	0	0	0	0	0	0	35	9,665	0
Portland[2]	0	0	0	0	0	0	1	100	0
Saybrook[2]	0	0	0	0	0	0	35	9,387	0
Westbrook[2]	0	0	0	0	0	0	32	12,090	0
	9	1,594	1	1,995	25,630	107,227	246	83,164	77
Hartford County									
Avon[3]	0	0	0	0	0	0	13	4,560	0
Berlin[6]	7	112	2	5,938	2,543	22,928	69	13,877	24
Bloomfield[1]	0	0	0	0	1,933	0	0	0	0
Burlington[2]	4	366	0	0	12,586	46,069	6	1,839	50

Canton[6]	8	8,738	0	0	51,014	34,256	56	11,723	28
East Granby[2]	2	130	0	0	460	2,588	0	29	13
East Hartford[2]	0	0	0	0	0	0	3	1,103	3
East Windsor[2]	0	0	0	0	0	0	74	17,084	3
Enfield[2]	2	31	0	0	1,002	353	83	22,539	8
Farmington[3]	4	1,064	0	0	25,304	16,796	71	17,053	8
Granby[6]	16	6,706	0	0	419,657	62,689	49	11,638	70
Hartland[2]	13	615	0	0	17,523	51,133	25	10,342	47
New Britain[2]	1	1	0	0	176	1,244	50	8,960	0
Newington[2]	0	0	0	0	12	185	35	8,793	0
Plainville[2]	0	0	0	0	0	0	4	1,085	0
Rocky Hill[2]	0	0	0	0	0	0	20	5,051	0
Simsbury[2]	5	1,570	0	0	51,801	29,233	21	5,962	12
Southington[6]	1	57	0	0	1,639	13,264	26	5,271	3
South Windsor[2]	1	3	0	0	0	479	40	11,570	12
Suffield[2]	4	33	0	0	37	1,552	46	18,264	5
West Hartford[4]	2	317	0	0	4,559	5,197	2	770	0
Wethersfield[2]	2	36	0	0	157,714	114,575	41	8,607	11
Windsor Locks[2]	0	0	0	0	0	0	17	4,905	0
	72	19,779	2	5,938	747,960	402,541	751	191,025	297
New Haven County									
Ansonia[3]	0	0	0	0	0	0	28	2,098	0
Bethany[3]	0	0	0	0	0	0	22	6,444	0
Branford[2]	4	17	0	0	937	2,350	65	15,856	0
Derby[3]	0	0	0	0	0	0	32	3,494	0
Guilford[2]	1	11	0	0	226	3,900	121	30,509	8
Hamden[3]	0	0	0	0	0	0	39	7,844	0
Madison[2]	0	0	0	0	0	0	64	21,410	0
Meriden[6]	3	171	1	6,435	9,595	39,837	34	2,405	29
Middlebury[3]	0	0	0	0	0	0	12	2,998	0
Milford[3]	0	0	0	0	0	0	133	14,050	0
Naugatuck[3]	0	0	0	0	0	0	82	8,960	0
North Branford[3]	0	0	0	0	0	0	39	15,824	0
North Haven[2]	0	0	0	0	0	0	69	11,543	0
Oxford[3]	0	0	0	0	0	0	7	3,080	0

Towns	Infestations found	Egg-clusters creosoted	Number colonies sprayed	Lbs. lead used	Larvae, pupae crushed	Bands applied	Miles scouted	Acres scouted	Acres cleaned
New Haven County (*Continued*)									
Seymour[3]	0	0	0	0	0	0	55	8,719	0
Wallingford[3]	4	260	4	8,676	126	10,075	58	9,668	0
Waterbury[2]	0	0	0	0	0	0	190	13,530	0
Wolcott[6]	8	621	2	8,160	10,775	5,853	52	15,800	164
	20	1,080	7	23,271	21,659	62,015	1,102	194,232	201
Litchfield County									
Barkhamsted[2]	24	936	0	0	129,932	118,563	31	10,981	30
Canaan[3]	13	1,318	7	55,026	3,099	23,017	61	23,997	94
Colebrook[2]	1	7	0	0	564	4,826	18	7,121	0
Cornwall[3]	3	12	1	630	167	0	18	8,019	8
Goshen[3]	0	0	0	0	0	0	26	11,021	0
Harwinton[3]	1	2	0	0	377	4,800	1	337	2
Kent[3]	1	22	0	0	1	1,812	5	671	0
Litchfield[3]	3	38	0	0	42	1,266	13	3,927	0
New Hartford[2]	3	144	0	0	15,456	20,677	73	23,423	51
Norfolk[3]	3	82	2	2,625	11	1,848	85	33,631	0
North Canaan[3]	2	36	0	0	0	5,559	47	10,957	1
Salisbury[3]	5	290	1	1,485	2	19,633	22	9,987	58
Sharon[3]	1	14	0	0	0	0	11	4,487	0
Warren[3]	7	1,016	5	32,180	7,069	575	32	6,221	148
Winchester[3]	1	14	0	0	60	332	5	980	13
	68	3,931	16	91,946	156,780	202,908	448	155,760	405
Fairfield County									
Danbury[3]	0	0	0	0	0	0	76	8,762	0
Darien[3]	0	0	0	0	0	0	21	2,481	0
Fairfield[3]	0	0	0	0	0	0	159	18,350	0
Greenwich[3]	0	0	0	0	0	0	68	8,131	0
New Canaan[3]	0	0	0	0	0	0	28	3,177	0
Newtown[3]	0	0	0	0	0	0	39	8,707	0

Norwalk[3]	0	0	0	0	0	0	125	9,958	0
Ridgefield[3]	0	0	0	0	0	0	67	11,378	0
Shelton[3]	0	0	0	0	0	0	66	11,330	0
Stamford[3]	0	0	0	0	0	0	17	2,636	0
Stratford[3]	1	larval	1	98	38	200	128	6,063	0
Westport[3]	0	0	0	0	0	0	95	9,179	0
Wilton[3]	0	0	0	0	0	0	15	3,374	0
	1	0	1	98	38	200	904	103,526	0

Summary of Statistics

Counties	No. towns	Infestations found	Egg-clusters creosoted	Number colonies sprayed	Lbs. lead used	Larvae, pupae crushed	Bands applied	Miles scouted	Acres scouted	Acres cleaned
Windham	7	22	109,839	1	648	1,181,005	5,571	24	5,202	0
New London	14	55	129,913	10	5,376	66,757	34,065	247	16,966	179
Tolland	13	146	92,035	14	4,233	565,355	46,708	294	31,699	511
Middlesex	12	9	1,594	1	1,995	25,630	107,227	246	83,164	77
Hartford	23	72	19,779	2	5,938	747,960	402,541	751	191,025	297
New Haven	18	20	1,080	7	23,271	21,659	62,015	1,102	194,232	201
Litchfield	15	68	3,931	16	91,946	156,780	202,908	448	155,760	405
Fairfield	13	1	larval	1	98	38	200	904	103,526	0
	115	393	358,171	52	133,505	2,765,184	861,235	4,016	781,574	1,670

[1]State work.
[2]CCC work.
[3]WPA work.
[4]State and CCC work.
[5]State and WPA work.
[6]CCC and WPA work.
[7]Resettlement Administration work.

Financial Statement

July 1, 1935–June 30, 1936

RECEIPTS

Appropriation year ending June 30, 1936	$40,030.00
February 11, 1936, Return premium from The Connecticut Indemnity Co.	69.85
June 30, 1936, Transferred from State General Fund	678.52
Total Receipts	$40,778.37

DISBURSEMENTS

Personal Services:	
Salaries	$14,158.80
Labor	19,896.92
Supplies and Materials:	
Stationery and office supplies	55.14
Chemicals	45.36
Insecticides	967.95
Lumber and small hardware	3.08
Auto oil	106.63
Other supplies (miscellaneous)	28.29
Communication Service:	
Telephone	60.90
Postage	15.00
Travel Expenses:	
Outlying investigations	213.10
Gasoline	1,173.75
Transportation of Things:	
Freight, express and parcel post	13.06
Heat and Light:	
Fuel	46.88
Electricity	29.40
Contingent Expenses:	
Insurance	273.93
Medical services	8.00
Equipment:	
Furniture, furnishings and fixtures	21.83
Tools, machinery and appliances (new)	494.13
Tools, machinery and appliances (repairs)	61.75
Automobiles (new)	2,253.55
Automobiles (repairs)	393.92
Buildings and Land:	
Rent of storehouse, office space and garages	457.00
Total Disbursements	$40,778.37
Balance on hand July 1, 1936	.00
	$40,778.37

Scouting for the Brown-Tail Moth

The brown-tail moth, *Nygmia phaeorrhoea* Don., a native of Europe, discovered in this country in eastern Massachusetts in 1897, first appeared in Connecticut in 1910, and soon spread over the eastern half of the State. Over a period of seven years, attempts were made to control it by cutting off and burning the winter nests on the ends of the branches of various fruit and woodland trees. Then the pest quickly disappeared in Connecticut, probably through natural causes, and although our men have watched for it, not a nest has been seen since 1919.

Nevertheless, this insect has been present continuously in an area in northeastern Massachusetts, southeastern New Hampshire and southwestern Maine, and in the last few years has shown a marked increase and spread. When relief projects were sought in these three states, one of the important projects accepted was that of cutting off brown-tail winter nests, and many men were given employment. This work was under the general supervision of the Bureau of Entomology and Plant Quarantine office at Greenfield, Mass., but local supervision was given by state officials in charge of moth control.

On December 9, 1935, a brown-tail moth scouting project was started in eastern Connecticut, under the supervision of Dr. J. N. Summers, of the Bureau of Entomology and Plant Quarantine office at Greenfield, Mass., with funds allotted by the Works Progress Administration. Inasmuch as a brown-tail scout had not been carried on in this State for several years, the opportunity to ascertain the truth regarding brown-tail moth conditions in Connecticut was welcomed. The work was started in towns bordering on Massachusetts, where infestations were known to exist. In all, 24 towns in the eastern section of Connecticut, bordering on Massachusetts and Rhode Island and a few along the coast, were examined and no brown-tail moth infestations were found.

Work on this project stopped on April 30, 1936, and the men on it, most of whom were taken from the relief rolls of the different towns where work was performed, were transferred to other work. Field supervision of the project was carried on by men from the regular state force under Mr. Ashworth.

During the life of this project it is estimated that 1,844 miles of roadside, and 169,648 acres of woodland and open country were scouted.

Appropriation

A request for an appropriation of $50,000 annually for the biennial period ending June 30, 1939, for suppression of the gypsy moth, was included in the budget of the Connecticut Agricultural Experiment Station. The action of the Budget Committee is unknown to us at this time.

CONTROL OF THE EUROPEAN CORN BORER, 1936

M. P. Zappe, Neely Turner and J. C. Schread

Activities of this office toward the control of the European corn borer in 1936 were directed along the following lines: (1) Compulsory clean-up; (2) Date of planting in relation to corn borer damage; (3) Insecticides on corn and dahlia plants; (4) A second trial of Trichogramma parasites.

The enforcement of the compulsory clean-up law was in charge of Mr. Zappe. Experiments on the date of planting in relation to corn borer damage were carried out by Mr. Turner. Experiments with insecticides for the control of the European corn borer on corn and dahlia plants were conducted by Mr. Turner, in coöperation with Dr. C. H. Batchelder of the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, a detailed report of which will be published elsewhere. The Trichogramma trials were carried on by Mr. Schread, as a check on similar work of 1935, a report of which may be found in Bulletin 383 of this Station, pages 344–346.

Compulsory Clean-up

Section 2125 was amended by the General Assembly of 1935, and set the final date for cleaning up fields and gardens at April 25. The revised law may be found in Bulletin 383 of this Station, page 302. Director Slate issued the following clean-up order:

EUROPEAN CORN BORER
CLEAN-UP ORDER FOR 1936

Pursuant to the provisions of Section 2125 of the General Statutes of Connecticut as amended by the General Assembly of 1935, I, William L. Slate, Director of the Connecticut Agricultural Experiment Station, do hereby issue orders, rules and regulations, as follows:

That throughout the entire State, on account of the European corn borer, *Pyrausta nubilalis* Hbn., all cornstalks, stubble, and the larger weeds in and around the corn fields, and all infested stalks of dahlia or other flowering or vegetable plants, be disposed of by feeding to live stock, burning, or plowing under cleanly, on or before April 25, 1936.

(Signed) W. L. Slate
Director.

February 27, 1936.

On April 27, nine inspectors began work in those sections of the State wherein the corn borer has caused the greatest damage. Each inspector was assigned a definite territory containing from seven to nine towns, depending upon the area, and permitted to use his own automobile for transportation, for which payment was made on a mileage basis. All work was completed by June 1, except for a few cases of violations still pending in town courts.

Altogether 70 towns were covered, situated mostly along the coast and in the valleys of the three largest rivers emptying into Long Island Sound.

Inasmuch as the inspections were made after the date of April 25, fixed by Statute, all cornstalks or other corn debris found present on farms were considered to be a violation of the law, and in such cases the names of

the owners were given to the prosecuting officers of the towns in which the violations occurred. In most cases the prosecutors notified the violators to clean up their premises immediately, or that prosecutions would follow. Some of the prosecutors gave the inspectors written orders to be read to the violators, directing them to follow the clean-up instructions within a definite short period of time. In most instances these methods brought results and all material that might harbor corn borers was disposed of satisfactorily before the adult moths could emerge from it. However, in spite of the warnings, a few growers neglected to comply with the orders and 10 of them were arrested and convicted in the local courts. In most cases fines were remitted, but violators were required to pay the costs of court action.

In this inspection work the nine inspectors altogether traveled 13,242 miles. Their salaries, travel and other necessary expenses amounted to $1,817.30.

Date of Planting Experiment

Corn was planted at 10-day intervals from April 20 to July 10, to determine the relation between the date of planting and corn borer injury. The four varieties used were: (1) Spancross C-2, an extra early yellow hybrid, (2) Golden Early Market, (3) Whipcross P-39, a mid-season yellow hybrid, and (4) Redgreen, a late white hybrid. As the ears were harvested, they were examined for infestation by corn borer larvae.

As in 1935, both the date of planting and the date of maturity affected the infestation. In 1936, all corn maturing between July 11 and 25 was at least moderately infested. Mid-season and late corn maturing before August 7 was also moderately infested. Early varieties of corn maturing from July 25 to August 20 were relatively free from infestation. Mid-season and late corn maturing between August 7 and 24, was also almost free from damage. The second generation caused moderate damage to corn maturing between August 24 and September 11.

The results also indicated that all corn maturing before July 25 was sufficiently infested to justify the use of sprays or dusts to control the corn borer.

Insecticide Investigations

Coöperative experiments with the Federal Bureau of Entomology and Plant Quarantine, Division of Cereal and Forage Insects, have been continued during the past year. In June, 1936, some of the results were published in Circular 114. Results of the 1936 season were taken into account in preparing a revision, published as Circular 118. Briefly the tests showed that nicotine tannate, phenothiazine and pure ground derris root were highly effective when applied in sprays on early sweet corn and that a spreader was necessary for best results. Figure 40 shows sprayed corn and Figure 41 untreated corn.

Some of the results of the coöperative experiments have been prepared for publication in 1937.

Experiments were also carried on to control second generation corn borers infesting dahlias. The same materials as used on corn were effective when applied five times at weekly intervals starting August 10. Figure 42 shows an infested dahlia shoot.

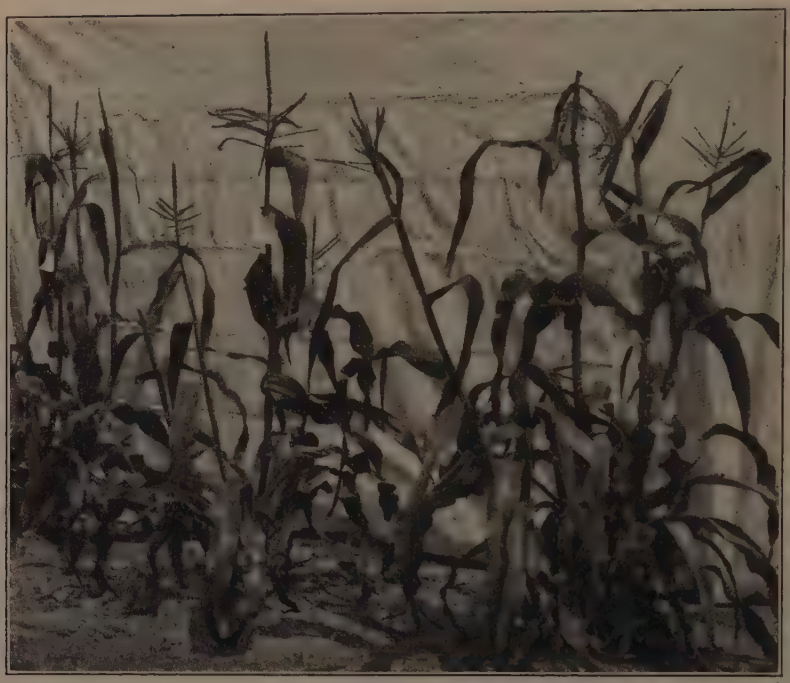

FIGURE 40. Corn protected by spraying. Only slight breakage from corn borer infestation.

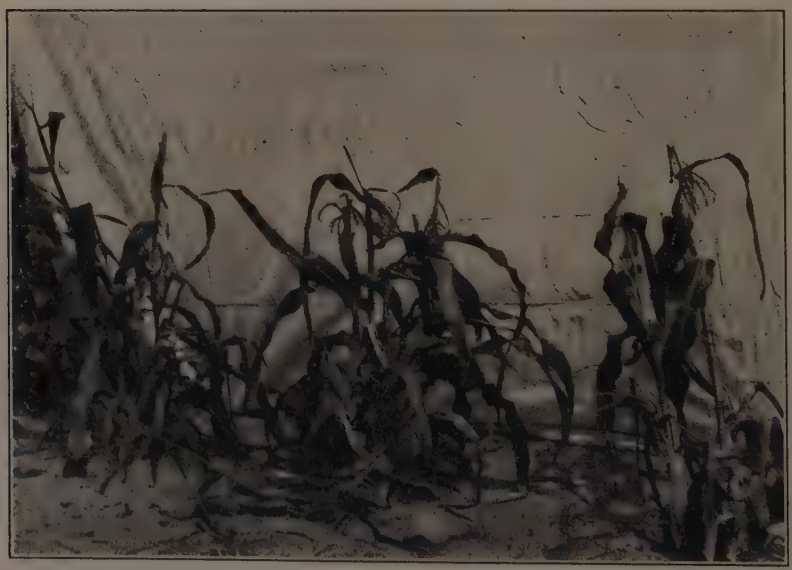

FIGURE 41. Untreated corn plants. Note the heavy stalk breakage due to corn borer infestation.

FIGURE 42. Dahlia shoot injured by European corn borer. At right, stem cut open to show borer.

A Second Trial of Trichogramma Parasites

Initial work in 1935 with Trichogramma as an egg parasite of the European corn borer was conducted exclusively in the corn plantations of the Associated Seed Growers of Milford. In 1936 investigations were pursued for the most part in market gardens in the same town. This rearrangement was considered advisable because practically all of the corn plants used in 1935 were topped in mid-season leaving but every fifth or sixth row as a pollinator. This meant removal of portions of the cornstalks that are most commonly used for corn borer egg deposition. Resulting data, therefore, were of questionable value.

Thirty-three fields were employed in the 1936 experiments. These were divided into three parts according to the maturing dates of the corn. For convenience and uniformity of treatment, the sweet corn maturing for table use was classified as (1) early corn—that ripening between July 4 and the first week in August; (2) intermediate corn—that ripening between the second week in August and the first of September; (3) late corn—all corn ripening after September first. The average area per plot was one acre. There were 16 varieties of corn represented in the plantations under observation. Of these, Golden Bantam was the most popular, with Whipple's Yellow and Improved Golden Bantam taking second and third

place respectively. Altogether, 6,882 egg-masses were collected, which is 3,000 more than in 1935. Table 3 gives the 1936 seasonal record of corn borer egg collections.

TABLE 3. CORN BORER EGG-MASS COLLECTIONS, 1936

	Number egg-masses	Number eggs in masses	Average number eggs per mass
1st brood	3,894	60,824	15.6
2nd brood	2,988	61,163	20.4
Totals	6,882	121,987	

Note: Mr. Alfonzo DeCaprio made all of the egg-mass collections in 1936.

In the early part of the season Trichogramma were released at the rate of 16,000 per acre. Since the initial colonizations showed negligible results, larger numbers of parasites were released later. The largest colony for the first brood totaled 64,000 and was set out in June. Colonizations for the second brood followed no specific rule on unit acreage basis. One plantation received parasites at the rate of 32,000 per acre, while another, composed of six acres, received 168,000 parasites. During August and September the average parasitism was generally much higher than for the first half of the season. This is not at all surprising since releases early in the season were augmented by ridiculously large liberations in August and strengthened perhaps by natural means as well.

However, from an economic standpoint, the release of a hundred thousand or more egg parasites per plantation is prohibitive. When a release of 128,000 Trichogramma resulted in but 4.66 percent parasitism, and a final examination of the stalks in the field showed 84 percent of them tunneled; or when the release of 160,000 parasites destroyed but an average of 23.35 percent of the existing eggs with a resultant 71 percent of the stalks tunneled at harvest, very little can be said in favor of Trichogramma for corn borer control purposes. The highest average parasitism for the second half of the season was 32.67 percent following the release of 32,000 parasites in one-half an acre of corn; 96 percent of the stalks in this small plantation revealed borer damage at harvest time. The lowest August-September average parasitism in released areas was .93 percent resulting from a total seasonal liberation of 120,000 Trichogramma; 56 percent of the stalks were tunneled. Statistics of this work are shown in Table 4.

TABLE 4. EGG COLLECTIONS, PERCENTAGE OF PARASITISM AND PERCENTAGE OF STALKS TUNNELED AT CLOSE OF SEASON

Plantation number	Number corn borer eggs	Number parasites released	Average percent parasitism	Percentage of stalks tunneled
1	1,891	Check	.01	79
2	4,233	4,000	.97	43
3	1,907	72,000	1.36	64
4	1,228	72,000*	1.67	34
5	3,017	Adjacent*	2.77	—
6	3,046	Adjacent	2.86	—
7	2,837	8,000	1.79	—
8	3,005	120,000	.86	56
9	3,295	8,000	4.87	—

TABLE 4—CONTINUED

Plantation number	Number corn borer eggs	Number parasites released	Average percent parasitism	Percentage of stalks tunneled
10	3,726	16,000	.70	—
11	1,354	Adjacent	3.04	—
12	1,448	48,000	.25	—
13	5,879	Check	.00	—
14	9,843	40,000	2.58	—
15	5,225	64,000	.01	—
16	2,644	Adjacent	2.33	84
17	2,380	160,000	23.35	71
18	1,503	Check	.00	—
19	1,519	16,000	.91	—
20	11,654	40,000	20.69	96
21	3,028	Adjacent	6.76	—
22	6,257	Check	12.67	100
23	3,333	48,000	7.24	—
24	4,333	Adjacent	2.81	—
25	1,437	96,000	1.44	—
26	220	Adjacent	.00	—
27	9,154	Check	11.43	100
28	2,780	32,000	7.20	—
29	1,090	Check	4.56	66
30	2,315	64,000	12.08	—
31	1,752	Adjacent	2.26	88
32	2,569	40,000	12.22	—
33	2,242	168,000	20.28	—

*Plantations near lots where parasites were liberated.

EUROPEAN CORN BORER IN POTATOES

NEELY TURNER AND M. P. ZAPPE

Late in September Mr. W. L. Harris, Hartford County Agricultural Agent, reported a heavy infestation of European corn borers in potatoes in Suffield. On October 2, several fields were visited with Dr. C. H. Batchelder and Mr. Harris. Eighteen acres of Green Mountains belonging to Samuel Spencer were heavily infested. Some of the plants in each field

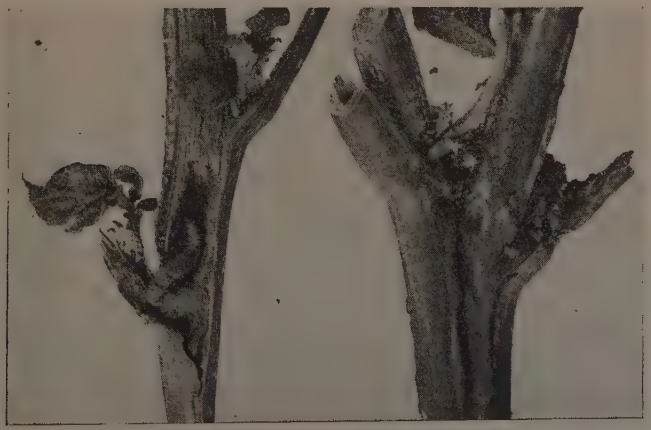

FIGURE 43. European corn borer in potato stalks. Natural size.

had died late in July. Although it was too late to determine the exact cause of the trouble, it was evident that nearly every dead plant had been infested by first generation corn borers. Mr. Spencer estimated the loss at 100 bushels per acre.

On the same trip, fields of two other growers in Suffield were visited. In one of these the plants had died late in July, and the infestation of corn borers was almost 100 percent. In the other field, there was some infestation but no serious damage. Figure 43 shows the corn borer in potato stalks.

On later trips surveys were made in the towns of Ellington, Enfield, Somers, Manchester and East Hartford. The infestations are given in the following list:

Grower	Town	Acreage	% plants infested
Leibman	Ellington	80	10
Lavitt	Ellington	45	74
Lavitt (Novikonis)	Somers	50	18
Grant	Manchester	9	25 (est.)
Wetstone	Ellington	80	25 (est.)
Norris	East Hartford	40	50 (est.)

An attempt was made to determine any losses in yield due to corn borer attacks. Individual hills were dug and the yield of infested and uninfested plants compared. As was expected, this method gave variable results and was not satisfactory. In most cases there was no difference in yield.

However, this survey did establish the fact that the European corn borer is a pest of potatoes. It is proposed that experiments be started in 1937 to determine the amount of damage caused by corn borers and possible remedies for use in the field.

JAPANESE BEETLE WORK IN CONNECTICUT, 1936

J. Peter Johnson

Scouting

Scouting for the Japanese beetle began on July 6 and ended September 12, 1936. There were five crews, each with a foreman and three scouts, stationed at Bridgeport, Hartford, Middletown, New Haven and Storrs. All were on federal funds, three of them working under the supervision of the Boston office, and the other two under the New Haven office. Five Chevrolet trucks were furnished for transportation by the United States Department of Agriculture.

As in past seasons, the crews followed an itinerary, scouting classified establishments, and others desiring classification, on an average of four times each. Altogether 112 establishments, many with subdivisions in other areas, were scouted. The minimum distance examined around each firm was 500 feet, and 346 beetles were found. In addition, the men scouted from one to four times each, the premises of 125 dealers in sand, soil, peat and manure, and three farm land establishments. Altogether, 157 more beetles were found during the summer of 1936 than in 1935, indicating an increase of infested classified establishments shipping under the Japanese beetle quarantine regulations.

TABLE 5. SUMMARY OF BEETLES FOUND

Location	Dates found	Number of beetles
Branford	July 28, Aug. 5, 12, 14, 21, 28, Sept. 8	65
Darien	Aug. 11	1
East Hartford	July 22, Aug. 1, 14, 26	7
Greenwich	July 15, Aug. 12, 27	4
Hamden	July 13, Aug. 14, 31	33
Hartford	Aug. 11, 15, 21	14
Meriden	Aug. 28	1
New Canaan	Aug. 7	1
New London	July 23, Aug. 10, 11, 13, 24, 25	88
North Haven	July 11	1
Ridgefield	July 22, Aug. 4, 5, 19, 20, 24, Sept. 3	68
Westport	July 9	1
Wilson	July 29, Aug. 8, Sept. 1	22
West Hartford	July 17, Aug. 8, 11, 20	31
West Haven	Aug. 11	4
Wethersfield	Aug. 14	5
Total beetles found		346

Trapping

Japanese beetle traps baited with liquid bait composed of geraniol and eugenol were placed in certain towns not known to be infested, beginning July 3, to learn whether or not these beetles were present. Twenty-four traps were placed in Canaan, 24 in Cheshire, 24 in Litchfield, 24 in Newtown, 48 in New Milford, 23 in Norfolk, 7 in Southbury, 31 in Thompsonville, 60 in Winsted and 20 in Woodbury. As the catches did not indicate any light, general infestation in these towns as the season progressed, the traps were left until September 4. The table below lists the number of beetles captured and the localities.

TABLE 6. BEETLES TRAPPED

Location	Dates found	Number of beetles
Canaan	Aug. 11	1
Litchfield	July 30	8
Newtown	Aug. 8, 17	2
New Milford	July 31, Aug. 13	2
Southbury	Aug. 17	1
Winsted	July 16, Aug. 22	2
Total beetles trapped		16

The following notes on the life history of the Japanese beetle in Bridgeport are by Dr. Philip Garman and Mr. J. C. Schread:

In Bridgeport systematic trap collections during 1936 by G. R. Smith of this office, as well as records of hand-picked beetles kept by estate owners in the heavily infested district, show that the Japanese beetle is becoming very abundant there. The records given (Table 7) are condensed from a large number of counts and indicate the greatest abundance during 1936 between July 9 and 19. The earliest capture in the Bridgeport area was on June 26, and beetles continued to feed and do damage until September 12. A few were caught in the traps as late as October 26. Records kept for two areas in New Haven show a similar trend but since the catches were not nearly so large as those in Bridgeport, the records are omitted.

TABLE 7. JAPANESE BEETLE COLLECTION IN BRIDGEPORT SHOWING SEASONAL ABUNDANCE

Dates	Park Ave.[1]	Poplar St.[3]	Eaton St.[3]	Washington Ave.[2]	Vine St.[3]	Totals
July 9, 19	17,065	2,963	1,552	2,504	2,373	26,457
July 20, 30	5,765	2,536	1,457	3,053	2,604	15,415
July 31, Aug. 10	4,633	2,185	1,349	2,822	2,113	13,102
Aug. 11, 21	3,211	2,748	1,302	3,311	2,827	13,399
Aug. 22, Sept. 1	1,697	976	571	4,138	2,287	9,669
Sept. 2, 12	701	287	284	1,029	783	3,084
Sept. 13, 23	24	88	84	228	311	735
Sept. 24, Oct. 4	5	14	14	14	30	77
Oct. 5, 15	0	0	0	0	10	10
Oct. 16, 26	0	0	0	0	6	6
Totals	33,101	11,797	6,613	17,099	13,344	81,954

[1] Hand-picked beetles plus number collected from four traps.
[2] " " " " " from one trap.
[3] Beetles collected from one trap.

Inspection and Certification

As in past seasons, the district inspectors were able to take care of the farm products quarantine inspection work in addition to their regular routine duties.

Inspection points were located as follows:

Location	No. of inspectors
New Haven	2
Manchester	1
Middletown	1
Willimantic	1
Westerly, R. I.	1
Total	6

Kind and amount of products certified:

Products	Amounts
Corn	2 bags
Beans	8.5 bushels
Apples	1 bushel
Peaches	15.5 bushels
Cut flowers	10 boxes

The total number of plants inspected and certified for shipment to other states and foreign countries was 1,849,407, while 26 carloads of sand and 26.5 carloads of manure were shipped to other states.

The number of certificates issued is shown below:

TABLE 8. CERTIFICATES ISSUED

Kind	Farm products	Cut flowers	Nursery and ornamental stock	Sand, soil	Manure	Total
"A"	15	8	39,019	198	0	39,240
"B"	1	1	8,317	166	17	8,502
Stamp	29	1	1,451	0	0	1,481
Total	45	10	48,787	364	17	49,223

Grub Digging, Spring and Fall, 1936

On March 30, T. Brigham, F. M. Brooks, L. A. Devaux and J. C. Schread made diggings for Japanese beetle grubs at sites of infestations in Bridgeport. Holes were dug 2 feet long, 1 foot deep and 1 foot wide, and the average number of grubs found per square yard was 100. Below are listed the locations, number of grubs and number of holes dug.

Location	Number of grubs	Number of holes
Colman St., 117	28	1
Herkemer St., 132	37	2
Herkemer St., 142	77	4
Herold Ave., 200	50	4
Herold Ave., 202	8	1
Howard Ave., 955	39	1
Lorraine St., 27	186	4
Park Ave., 1910	66	3
Poplar St., 114	53	1
Poplar St., 122	13	1
Poplar St., 146	20	1
Poplar St., 153	49	1
Poplar St., 164	28	2
Vine St., 235	13	1
Vine St., 249	6	1
Washington Ave., 87	21	2
Washington Ave., 105	28	2
Totals	722	32

On October 20, L. A. Devaux and G. Smith made similar grub diggings in Bridgeport, at two locations where beetle traps had been placed during the summer, to determine whether or not the placing of the traps had decreased the grub infestation. The average number of grubs dug was 72 per square yard, most of them found at a depth of from 8 to 10 inches. A total of 17,099 beetles had been taken in traps at the Washington Avenue address and 30,268 on the Park Avenue place. These were considered heavy infestations. It is believed that the traps were responsible for the small number of grubs found.

Location	Number of grubs	Number of holes
Park Ave., 271	108	4
Washington Ave., 87	56	6
Totals	164	10

General Japanese Beetle Survey

During the summer of 1936, Japanese beetle infestations throughout the State were general at the original locations. The only places showing any marked increase were Bridgeport, Hartford and Ridgefield. Other infestations were practically the same as in preceding years, and in some localities were lighter. Although there was no great increase in some places, the beetles seemed to have spread and there were many new infestations. Trapping revealed that six new towns were infested, although the number of beetles caught was small. There did not seem to be any real peak of adults present this past season. The first ones were found June 26 and the last ones October 22, which is the latest that beetles have been known to be present in the State.

A general survey was made of some of the older infestations and the notes below will give a general idea of the condition that existed.

Date	Extent of infestation
Ansonia	
August 3	Light
Branford	
July 16	Light
Bridgeport	
July 8	Light and general
July 15	General
July 22	General and heavy
August 11	Light
August 15	Heavy
August 17	Very heavy
Danbury	
July 22	Very light
East Hartford	
August 12	Light
East Norwalk	
July 27	Very light
Fairfield	
July 20	Very light
Greenwich	
July 28	Light
Groton	
July 23	None
August 5	None
**August 5	General
(Home of Comm. Sub. Base)	
Hartford	
July 17	Light
July 22	Heavy
July 22	Very heavy (Riverside Park)
July 28	Very heavy (Riverside Park)
August 12	General
Mystic	
July 23	General
August 5	Very light
New Canaan	
August 26	Light
New Haven	
July 17	General
July 22	General
July 29	General
August 17	General
New London	
July 23	Light
August 5	General
Norwalk	
August 13	General
Norwich	
July 23	General
Old Saybrook	
July 23	Very light
August 5	Very light
Putnam	
August 7	General
Ridgefield	
July 30	General
August 10	Very heavy
August 24	Very heavy
Sept. 3	General
Stamford	
July 10	Light
Stratford	
August 15	Light
Torrington	
August 3	Very light
Waterbury	
July 21	Very light (1 beetle)
Willimantic	
July 23	Very light
August 12	Light
Windsor-Windsor Locks	
July 27	General
August 12	Light

It will be noted that the peak of the infestations as shown in the survey came between July 22 and August 24, earlier in some towns than in others. The records given are only for those days on which observations were made, and the survey was primarily on sites where beetles had been reported during the past few years.

Japanese beetle feeding on plants was observed in Bridgeport, New Haven, Hartford and Ridgefield in 1936. In Bridgeport, general feeding

** At the site of the original infestations, no beetles could be found on two visits. Word was received that the U. S. Naval Submarine Base had beetles. Upon visiting the base none could be found, but at the home of the Commander about two miles distant, several hundred were found.

was noted on grapevines, roses, hollyhocks, a horse chestnut tree, a sassafras tree and to some extent on a few favorite shade trees which were plant hosts of the beetle. General feeding and resulting damage occurred only where beetles were abundant.

In New Haven at one location the beetles were observed feeding on grapevines, azaleas, an apple tree, hollyhocks, hydrangea and a barberry hedge.

The beetles were feeding generally on the elm trees in Riverside Park, Hartford, as well as on the willow trees, flower garden and Japanese barberry hedge.

White birch, maple and linden trees were attacked on two estates in Ridgefield, with general feeding on low growing plants.

A small amount of feeding was noted on one Japanese red pine in Branford, while general feeding took place in the nearby flower garden.

The Hartford Park Department used 30 tons or more of lead arsenate in treating the turf in Riverside Park, Bushnell Park, and that portion of Elizabeth Park containing the rose gardens. This treatment kills the Japanese beetle grubs present in the soil and those hatching out from the eggs laid in the treated soil.

NOTES ON HYMENOPTEROUS PARASITES OF ELM INSECTS IN CONNECTICUT

B. J. Kaston

While engaged in studying the parasites of the elm bark beetle, *Hylurgopinus rufipes* Eich., incidental observations were made on hymenopterous parasites of the associated fauna in elms. The species[1] to be considered may be conveniently discussed in three groups.

Group I. Species of which the actual host is definitely known, by rearing. (In all cases where the duration of the pupal stage is given, the specimens were at a constant temperature of 23° to 24° C., and a relative humidity of about 65 percent.)

Spathius canadensis Ashmead (Figures 44 and 45). A list of the known hosts of this variable and polyphagous species has already been published by Kaston and Becker (1936). Adult specimens have been collected from June 12 to September 24 in the towns of Branford, Cheshire, Haddam, Hamden, Hartford, Orange, Redding, Rocky Hill, and Stamford. Specimens have been reared out of elm material from the following additional localities: Barkhamsted, Canton, Danbury, Glastonbury, Killingly, Southbury, South Windham, Washington, and Windsor Locks. The host most frequently attacked is *H. rufipes*, though several instances have been noted of attack on the weevils, *Magdalis barbita* Say, and *M. armicollis* Say. Imagines emerging from the weevil hosts are much larger than those from *H. rufipes*, indicating a positive correlation between host size and parasite size. Even those emerging from *H. rufipes* vary in size a great deal, and it is suggested that this may be due to the fact that development can evidently be completed on host larvae of different ages. It has been found that larvae of at least the last, penultimate, and antepenultimate instars are attacked. The parasite attaches itself to the side or dorsum of the host larva (Figure 45D), often with its head at the level of the host's metathorax.

[1] I am indebted to Messrs. J. C. Schread and C. F. W. Muesebeck for aid in the identification of species.

When first made, the cocoon is pale yellow in color, later turning to a dark brown. It is papery, covered with loose fibers, and usually has adhering to it particles of frass from the host's tunnel. The average dimensions of 17 cocoons were 4.5 by 1.4 mm.

During the elongation of the prepupa, two or three days before pupation, seven or eight fecal pellets are discharged. Visible through the cuticula are the lightly pigmented compound eyes of the developing pupa.

FIGURE 44. *Spathius canadensis.* Dorsal aspect of female. Enlarged about 12 times.

For about the first six days of pupal life the eyes are the only pigment-bearing parts of the body, and only during the remaining three days of the nine-day pupal period does the rest of the body become pigmented. The imago cuts a subterminal hole in the cocoon and emerges from the bark through a circular hole about .75 mm. in diameter. This exit can be readily distinguished from those of *H. rufipes*, which are about 1.25 mm. in diameter. The parasite probably has two broods a year and winters over in the prepupal stage within the cocoon.

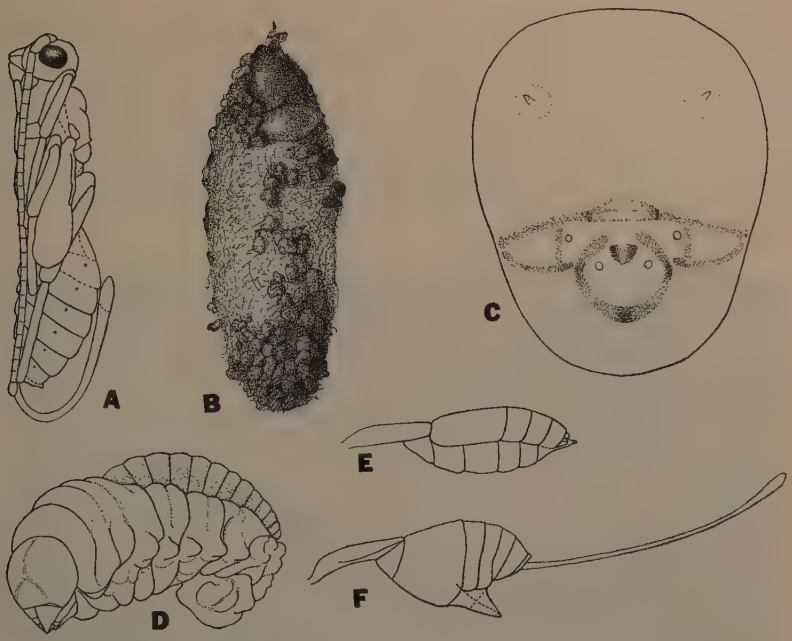

FIGURE 45. *Spathius canadensis*. A, pupa. B, cocoon. C, anterodorsal aspect of the prepupal head. D, feeding larva on its host, the larva of *Hylurgopinus rufipes*. E, lateral aspect of the abdomen of an adult male, and F, of an adult female.

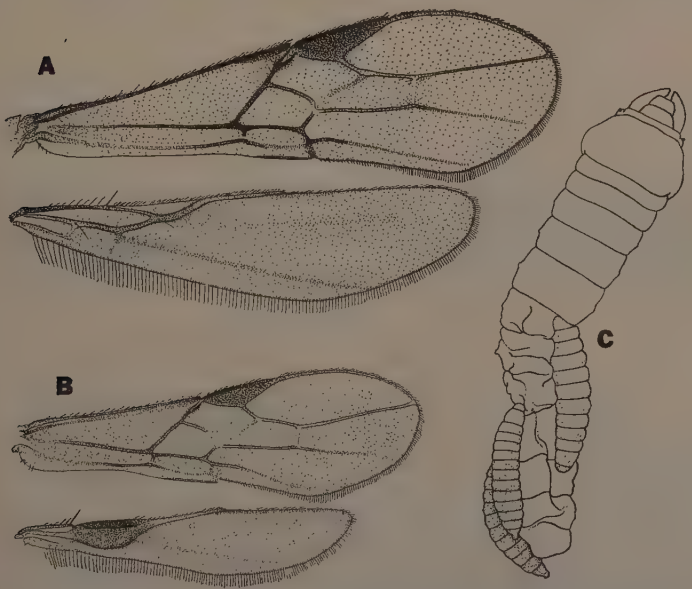

FIGURE 46. *Heterospilus* sp. A, wings of female. B, wings of male drawn to the same scale as A. Note stigma on hind wing. C, three feeding larvae on the host, the larva of *Saperda tridentata*.

Heterospilus sp. (Figures 46, 47A, 48A, F, and 49B). Of this species (labeled "n. sp." by Muesebeck), adults have been collected at Middletown in June, at Orange and Rocky Hill in August, and at Hartford in September. Specimens have been reared from Branford, Cheshire, Hamden, and Killingly. In addition, cocoons were seen at Barkhamsted, Canton, Danbury, and Windsor. The usual host is the larva of the common elm borer, *Saperda tridentata* Olivier, though in a few instances the cocoons containing prepupae were found in the galleries of *Hylurgopinus rufipes*. In the latter instances only one cocoon per gallery was noted, while in the

FIGURE 47. A, seven cocoons of *Heterospilus* in the tunnel of a single host larva (x6). B, *Atanycolus ulmicola* ovipositing (x2).

Saperda galleries the usual number was three or four. Occasionally five larvae were found on a single *Saperda* and several times seven cocoons were found in one tunnel (Figure 47A). The parasites seem to attack the host most often near the middle of the abdomen (Figure 46C).

In a given lot of specimens from the same piece of bark, the males emerged after eight days, and the females after nine days of pupation. Only the eyes are pigmented until the fourth or fifth day. Copulation took place within a day or two of emergence.

The cocoon is papery, with a few loose fibers scattered over its surface, and some adherent frass particles from the tunnel of the host. The average

dimensions of 12 cocoons were 5.2 by 1.5 mm. The species winters over in the prepupal stage within the cocoon.

The drawing of the head of the prepupa (Figure 49B) has been made to show only those structures which are apparent when viewed with the ordinary powers of the dissecting binocular, for comparison under similar circumstances with the heads of the other species. A ligular sclerome is definitely lacking. Labial and maxillary palpi visible in the other species figured could not be discerned here, nor could various other structures included by Hill and Smith (1931) for *H. cephi* Rohwer.

Atanycolus ulmicola Viereck. (Figures 47B, 48C, G, and 49A). This species parasitizes the larva of the common elm borer, *Saperda tridentata* Olivier. One female was seen ovipositing through an exit hole of *Hylurgopinus rufipes*, but investigation revealed the presence of the tunnel of a half-grown *Saperda* larva underneath. *S. tridentata* has been reported by Felt (1905, p. 70) to be parasitized by another species, *A. simplex* Cresson, (sub *Melanobracon*), which he likewise lists (*op cit.* p. 261) as parasitic on the rustic borer, *Xylotrechus colonus* Fabr., also occurring on elms.

A. ulmicola seems to be the commonest parasite of *S. tridentata* in Connecticut. In some logs examined, the extent of parasitism was close to 100 percent (Kaston, 1935). Adults have been collected, from May 22 to September 24, at Barkhamsted, Branford, Cheshire, Hamden, Hartford, New Haven, and South Windham. Specimens have been reared out of material from the following additional localities: Coventry, Danielson, Sherman, and Washington. The duration of the pupal stadium is seven days, during the first four of which only the eyes are pigmented. Emergence in nature occurs from late May to mid-July. There is apparently only one generation per year, the species wintering over as a prepupa within the cocoon. The latter is usually opaque, papery, light to dark brown, with a few loose threads and frass particles on its surface. It is not ellipsoidal in shape, but rectangular in transverse section. The average dimensions of 10 cocoons were 10.7 by 3.7 by 1.9 mm.

Capitonius saperdae Ashmead. (Figures 48B, H). This species is a parasite of the larva of *Saperda tridentata* Olivier. It has also been reported (sub *Cenocoelius populator*) by Felt (1905, p. 85) as a parasite of the apple-tree borer, *Saperda candida* Fabr. Rohwer (1914) records it as parasitic on "*Saperda candida* in elm" [*sic*!] and it is likewise so given by Viereck (1916, p. 766). However, it is evident that S. *tridentata* was the host meant here. While the writer was unable to obtain any material evidence, there is a bare possibility that this species of *Capitonius* may also parasitize the wood borer, *Neoclytus acuminatus* Fabr. At two different localities, large numbers of the parasite were seen flying around and walking over elm logs in which equally large numbers of the beetle were ovipositing.

Adults have been collected from June 9 to August 3 at Branford, Cheshire, Collinsville, Haddam, Hamden, Orange, Wallingford, and West Haven. Specimens have been reared out of material from the following additional localities: Redding, Southbury, South Windham, Stamford, and Windsor Locks. The duration of the pupal stadium is 9 or 10 days for the male, and 10 or 11 for the female, during the first 5 or 6 of which only the eyes are pigmented. Emergence in nature occurs from late May to early August. The species winters over as a prepupa within the cocoon. The latter is

ellipsoidal, translucent, yellowish brown, and covered with fine, loose fibers. The average dimensions of seven cocoons were 8.3 mm. long by 3.1 mm. in diameter.

FIGURE 48. Cocoons and pupae of *Heterospilus* (A and F), *Capitonius saperdae*(B and H), *Atanycolus ulmicola* (C and G), and *Xorides albopictus* (D and E). A to D same scale, and E to H same scale.

Xorides albopictus Cresson. (Figures 48D, E, and 49C). This species is the fourth known by us to be parasitic on *Saperda tridentata*. It has been recorded (sub *Xylonomus*) by Hopkins (1893) as attacking *Agrilus*

and other Buprestid larvae in beech bark, and by Felt (1906, p. 500) from hickory infested with *Dicerca lurida* Fabr., on which it was probably parasitic. It is listed by Rohwer (1920, p. 438) from *Saperda discoidea* Fabr., and by Rhoads (1924, p. 180) from the latter species and *Neoclytus acuminatus* Fabr.

Adults have been collected from May 25 to September 24 at Cheshire, Darien, Hamden, Hartford, New Haven, and North Haven. Specimens have been reared out of material from the following additional localities: Danielson, Orange, and South Windham. The duration of the pupal stadium is known for only a single male for which it was eight days. Emer-

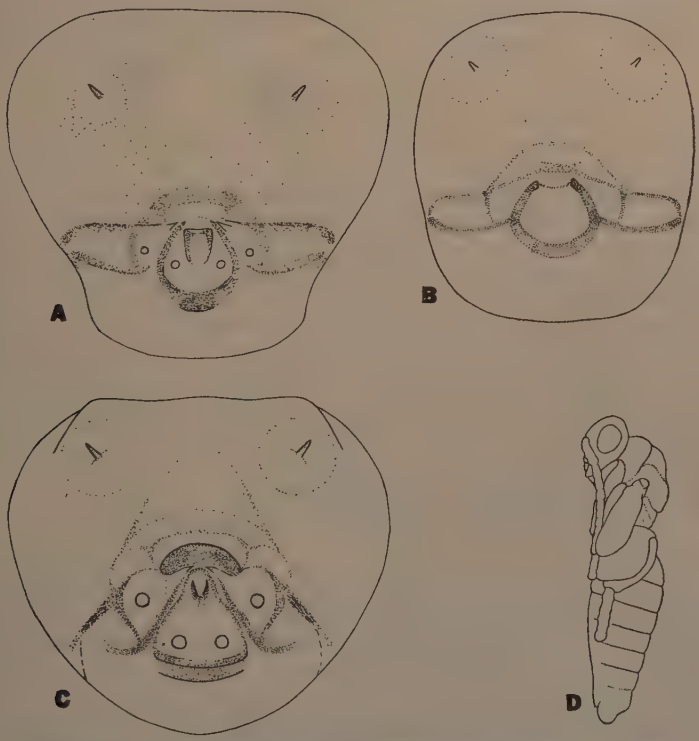

FIGURE 49. Anterodorsal aspect of the prepupal heads of A, *Atanycolus ulmicola* ; B, *Heterospilus*; and C, *Xorides albopictus*. D, pupa of *Trigonura hicoriae*.

gence in nature occurs from the middle of May to early July, and again about the middle of September. Hopkins (*loc. cit.*) reared specimens in July. Emergence holes in the bark are about 1.75 mm. in diameter. The species winters over as a prepupa within the cocoon. The latter is subellipsoidal, tapering more at one end than the other, translucent, and light tan to dark brown in color. The average dimensions of 12 cocoons were 13.4 by 3 by 1.7 mm.

The following keys to the cocoons and pupae of those species attacking *S. tridentata* may be useful when it is inexpedient or impossible to rear the parasite. These should be used in conjunction with Figure 48.

Key to Cocoons

1a. Ellipsoidal or subellipsoidal in shape, so that a transverse section is a circle or an ellipse 2
1b. Not ellipsoidal; of two oval shaped, but flat, sides in parallel planes, connected by a low wall perpendicular to them, so that a transverse section is a rectangle ..... *Atanycolus ulmicola*

2a. Opaque, about 3.5 times as long as wide, circular in transverse section. Usually occurring in groups of 3 or 4 ..... *Heterospilus* sp.
2b. More or less translucent. Always occurring singly 3

3a. About 2.5 to 3 times as long as wide. Transverse section a circle ..... *Capitonius saperdae*
3b. About 3.75 to 4.5 times as long as wide. Transverse section a flattened ellipse ..... *Xorides albopictus*

Key to Pupae

1a. Females 2
1b. Males 5

2a. Ovipositor bent in the form of a "U" or curved along the dorsum 3
2b. Ovipositor not bent in the form of a "U" but projecting more or less caudad ..... *Heterospilus* sp.

3a. Ovipositor extending to cervical region on the dorsal side. Antennae arising at a level behind eyes ..... *Atanycolus ulmicola*
3b. Ovipositor not extending to cervical region. Antennae arising farther forward 4

4a. Ovipositor extending to region of petiole. Antennae arising at a level anterior to eyes ..... *Capitonius saperdae*
4b. The bend of the ovipositor a considerable distance behind the abdomen so that the tip lies over merely the last abdominal segment. Antennae arising at a level slightly behind anterior border of eyes ..... *Xorides albopictus*

5a. Abdomen not at all, or very little, longer than head plus thorax 6
5b. Abdomen noticeably longer than head plus thorax 7

6a. Antennae arising at a level anterior to eyes ..... *Capitonius saperdae*
6b. Antennae arising at a level behind eyes ..... *Atanycolus ulmicola*

7a. Abdomen 1.25 times the length of head plus thorax. Antennae arising about the level of the posterior border of eyes ..... *Heterospilus* sp.
7b. Abdomen 1.5 times the length of head plus thorax. Antennae arising at a level slightly behind anterior border of eyes ..... *Xorides albopictus*

Trigonura hicoriae Rohwer. (Figure 49D). This is presumably the species which Rhoads (1924, p. 189) obtained from hickory and believes to be parasitic on both *Chrysobothris femorata* and *C. sexsignata* and perhaps on other associated Buprestids. We have adults collected during June and July from Branford and Hamden. Specimens were reared in early June out of material infested with *Magdalis barbita* Say and *M. armicollis* Say, from Mount Carmel, South Windham, and Torrington. The exact duration of the pupal stadium was not ascertained, for at the time the weevil tunnels were exposed the parasites had already pupated. One specimen which had evidently pupated quite recently, as its eyes were still unpigmented, required 12 days more to emerge. The parasite builds no cocoon, but pupates within the cuticle of the host.

Group II. Species which are known to have emerged from, or oviposited in, elm. The host may be presumed, though not definitely known from rearing.

Eubadizon magdali Cresson. This species has been recorded (sub *Calyptus*) by Cresson (1878), and by Rhoads (1924, p. 168) as parasitic on *Magdalis olyra* Hbst. in hickory. It has been reared by Felt (1905, p. 74) and by us from elm material infested with *M. barbita* Say and *M. armicollis* Say. Emergence occurred from Windsor Locks material on May 16, and from Hamden on June 6. Adults have been collected in May and June at Branford, Haddam, Orange, and Torrington, and in September at Cheshire.

Rhaphitelus maculatus Walker. Four specimens emerged May 16 from elm sticks infested with *M. armicollis* and *M. barbita* from Killingly.

Dibrachys sp. Of this species, (labeled "n. sp." by Gahan), a single specimen emerged May 16 from material infested with *M. armicollis* and *M. barbita* from Windsor Locks.

Trigonoderus algonquinia Girault. A single specimen emerged on May 16 from material collected at South Windham.

Rhysella nitida Cresson. Specimens in the Station collection have been reared out of maple and birch from Wallingford and Hamden respectively, and collected at Putnam, June 30. Adults were seen flying about and walking over a dead elm tree at Branford during June and early July. During August and early September, large numbers emerged from this same tree. On several occasions six or seven males were observed hovering around a spot where later a female emerged. In one instance a group was around an old emergence hole of some other insect, which evidently connected with the tunnel of an emerging female. When the female finally came out, she was seen to be already in copula with a male that had crawled down to her. This behavior is similar to that reported by Harrington (1887) for *Megarhyssa lunator*. Unfortunately, attempts to ascertain the host of this parasite were made too late to be successful. Rohwer (1920, p. 425) records it from the wood wasp, *Xiphydria maculata* Say.

Megarhyssa lunator Fabricius. The habits of this species are well known from the work of Riley (1888), Harrington (1887), Rhoads (1924), and others. It has been recorded as parasitic on the pigeon horntail, *Tremex columba* Linn. Specimens were observed ovipositing in June and September at Hamden and Old Lyme respectively. In the Station collection is material from the following localities: Greenwich, New Haven, Stonington, and Windsor.

Megarhyssa atrata Fabricius. This species has presumably the same habits and hosts as the preceding. A specimen was seen ovipositing in the same tree as a *lunator* at Hamden in June.

Ichneumon irritator Fabricius. In the Station collection there are specimens taken in New Haven, Salisbury, and Stamford, from April 21 to October 11. One specimen was taken ovipositing on a dead elm in Branford on June 9. This species (sub *Ephialtes*) was recorded by Chittenden (1893) from *Liopus variegatus* Hald. in box-elder. It is listed by Champlain (1922, p. 98) from *Cyllene pictus*, and from *Chrysobothris* sp. in redbud, and by Rhoads (1924, p. 179) from *Urographis fasciata* DeGeer in hickory. The latter author also cites Webster's rearing it from *Cryptorhynchus lapathi* Linn. in willow.

Ichneumon sp. Of this species, (labeled "n. sp." by Cushman), a single specimen was taken on June 24 ovipositing on the same tree as the *I. irritator* above.

Group III. Species which were merely collected from the surface of elms and which may or may not be parasites of elm insects.

Helconidea ligator Say. Specimens were collected at Branford, Hamden, and New Haven, from June 16 to June 24.

Amblyteles scitulus Cresson. In the Station collection are specimens taken at East River in July. One was collected on elm at Branford on June 24.

Amblyteles velox Cresson. A single specimen was taken at Branford on June 24.

Phygadeuon sp. A single specimen was taken at the same time, and from the same tree, as the *A. velox* above.

Isadelphus sp. A single specimen was taken at Collinsville on September 22.

Aroles decorus Say. In the Station collection is a specimen taken in Wallingford on June 28. One specimen was collected on elm at Mount Carmel, June 25. Felt (1905, p. 261) lists as its host in hickory *Xylotrechus colonus* Fabr., a rustic borer which occurs in elm occasionally. The parasite has also been reported by Cushman and Rohwer (1920) from *Tomoxia bidentata* Say, and from the latter species and *Dicerca lurida* Fabr. by Rhoads (1924, p. 177).

Cryptus vinctus Say. A specimen was collected at Niantic on September 12. Champlain (1922, p. 99) lists this species, (sub *Itamoplex*), as a parasite of the peach tree borer, *Synanthedon exitiosa* Say.

Meniscus mirabilis Cresson. A specimen was collected on elm at Hartford on September 24.

Hyptia harpyoides Bradley. In the Station collection are specimens collected during June and July at Hamden, Lyme, New Haven, Salem, Stamford, and Westport. A single specimen was taken on an elm tree at Canton on June 29.

Metapelma spectabilis Westwood. In the Station collection is a specimen taken in New Haven on September 7. Specimens were collected from elms at Branford in July and August.

Literature

Champlain, A. B. Records of hymenopterous parasites in Pennsylvania. Psyche, **29**: 95–100. 1922.

Chittenden, F. H. Observations on some hymenopterous parasites of Coleoptera. Insect Life, **4**: 247–251. 1893.

Cresson, E. T. Parasite on *Magdalis*. Psyche, **2**: 189. 1878.

Cushman, R. A., and Rohwer, S. A. The North American ichneumon flies of the tribe Acoenitini. Proc. U. S. Nat. Hist. Mus., **57**: 519. 1920.

Felt, E. P. Insects affecting park and woodland trees. N. Y. State Mus. Mem. **8**, **1**: 70, 74, 85, 261; **2**: 500. 1905-6.

Harrington, W. H. The nuptials of *Thalessa*. Canad. Ent., **19**: 206–209. 1887.
Hill, C. C., and Smith, H. D. *Heterospilus cephi* Rohwer, a parasite of the European wheat sawfly, *Cephus pygmaeus* (L.). Jour. Agr. Research, **43**: 597–609. 1931.
Hopkins, A. D. Catalog of West Virginia forest and shade tree insects. W. Va. Agr. Expt. Sta., Bul. **32**: 218. 1893.
Kaston, B. J. Elm Borer (*Saperda tridentata* Oliv.). Insect Pest Survey Bul., **15**: 49. 1935.
————and Becker, W. B. *Spathius canadensis* Ashm., a parasite of *Hylurgopinus rufipes* (Eich.). Jour. Econ. Ent., **29**: 807. 1936.
Rhoads, A. S. Report of an examination of hickory trees killed by hickory bark-borers. N. Y. State Col. Forestry, Tech. Bul. **17**: 36–269. 1924.
Riley, C. V. The habits of *Thalessa* and *Tremex*. Insect Life, **1**: 168–179. 1888.
Rohwer, S. A. Synopsis of the North American species of the genus *Capilonius* Brullé. Canad. Ent., **46**: 316. 1914.
———— The North American ichneumon-flies of the tribes Labenini, Rhyssini, Xoridini, Odontomerini, and Phytodietini. Proc. U. S. Nat. Mus., **57**: 405–474. 1920.
Viereck, H. L. Hymenoptera, or wasp-like insects of Connecticut. Conn. Geol. Nat. Hist. Survey, Bul. **22**: 240, 766. 1916.

THE SATIN MOTH

W. E. Britton

The satin moth, *Stilpnotia salicis* Linn., wholly or partially defoliated every Carolina poplar tree in Waterbury in 1936. Caterpillars were received from Waterbury June 15. In 1930 in an area of about one square mile in the northeastern portion of Waterbury, the poplar trees were infested and those around the Polish church on East Farms Street were entirely defoliated. Some of these trees were sprayed either in 1930 or 1931, and no reports of injury to them have since been received until June, 1936.

Mr. Schread of this department informs me that many of the poplar trees in Bridgeport were infested by the caterpillar in 1936. Some trees were entirely defoliated, and others partially stripped.

In 1933, Carolina poplars in Waterside Park and Beaver Park Playgrounds, New Haven, were partially defoliated by satin moth caterpillars. Some trees were about three-fourths stripped, and others less injured, and some showed only slight feeding.

The satin moth is a native of Europe, and was first discovered in the United States near Boston, Mass., in June, 1920. Since then it has spread through eastern Massachusetts, Rhode Island, the eastern two-thirds of Connecticut, the southeastern portion of New Hampshire and the southwestern portion of Maine.

Life History and Habits

In July the moths fly and lay their eggs in whitish masses on the bark. Each mass contains an average of 300 or more eggs, and is usually about half an inch wide and three-fifths of an inch long and somewhat oval in shape, although varying greatly in both shape and size, owing to the habit of the female in moving about if disturbed and laying more than one mass of eggs. Each egg-mass is covered with a white secretion that glistens in the sun.

The separate eggs are spherical and slightly flattened. At first they are light green but gradually turn brown. They hatch in about 15 days. During the first two larval instars the caterpillars feed on either the upper

or under surfaces of the leaves, usually on the underside. The first instar larvae feed for five or six days, then each encloses itself in a small web where it molts. Likewise the second instar larvae feed for about the same length of time; then each constructs in the crevices of the bark a hibernating web in which it again molts. Usually there is only one larva in each web but in heavy infestations sometimes two or more larvae may occur. The hibernating web or winter case is firm and strong and usually the larva inside does not leave its case or feed until the following spring. Emergence begins the last days of April and continues during the first three weeks of May. The caterpillars pass through seven instars or stages, and finally in June, they spin their cocoons usually in folded leaves, but also in the crevices of the bark, on buildings, in rubbish and other convenient places near their food trees. In 10 days the adults emerge, beginning late in June and continuing into July. There is only one generation each year.

The moths are attracted to lights and when abundant may often be seen resting with wings folded on electric light poles during the daytime.

Description

The adult moths of both sexes are white without colored markings and with a satin luster. The wing spread of the female is about two inches, and

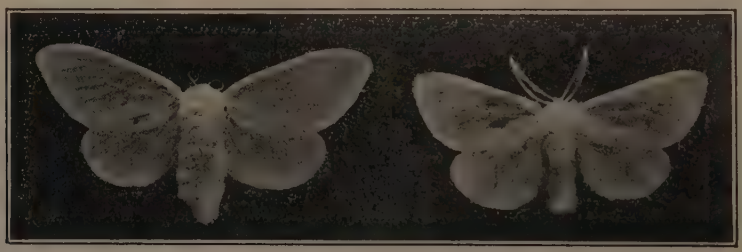

FIGURE 50. Female and male satin moths, natural size. (After Burgess and Crossman, Dept. Bull. 1469, U. S. Dept. Agr.)

that of the male about one and three-fourths inches, although considerable variation occurs. Both sexes are shown in Figure 50.

FIGURE 51. Caterpillar and cocoon of satin moth, natural size.

The full-grown caterpillar varies from one and one-half to two inches in length, head black with bluish tinge, and body blackish with finely reticulated white markings, with two narrow broken subdorsal lines, between

which is a row of large white spots or blotches which range from square to dumbbell shape. The tubercles are reddish brown and bear yellowish brown hairs. See Figure 51.

The pupa is nearly an inch in length, shining black, covered, except on the ventral surface, with tufts of long, silky, white and golden hairs. On each abdominal segment there is usually a row of light brown spots that vary in size and number and are occasionally absent. The cocoon is a very loose structure of few hairs that fasten the pupa to the leaves, twigs or other objects in which it occurs. The pupa is plainly visible through the cocoon, as is shown in Figure 51.

Food Plants

Thus far in Connecticut the satin moth has been found only on Carolina poplar, but according to Burgess and Crossman[1] nearly all kinds of poplar, and the golden willow, *Salix vitellina*, are favorable food plants. Scrub oak and black oak are partially favorable, but alder, apple, pear, birch, elm, maple, ash, hickory and the other kinds of oak are non-favorable.

Natural Enemies

Birds and parasitic insects aid in holding the satin moth in check. Among the birds that feed upon the small caterpillars are the starling, catbird, Baltimore oriole, blue jay and black-billed cuckoo. Several native insects are parasites of the satin moth, including five species of Tachinid flies, *Tachina mella* Walk., *Winthemia quadripustulata* Fabr., *Zenillia blanda* O.S., *Frontina frenchii* Will., and *Phorocera claripennis* Macq., all reared from the larvae and pupae. Of Hymenopterous parasites, *Telenomus californicus* Ashm. is reared from the eggs and is the most common. From the pupae, *Theronia fulvescens* Cress., *Ephialtes pedalis* Cress., *Itoplectis conquisitor* Say, and *Dibrachys hemerocampae* Girault, have been reared.

Several parasites introduced for the control of the gypsy moth and brown-tail moth are also enemies of the satin moth. The imported ground beetle, *Calosoma sycophanta* Linn., feeds upon the caterpillars. The Tachinid fly, *Compsilura concinnata* Meig., has been one of the most important enemies of the satin moth. Another species, *Sturmia scutellata* R. D., is of less value. *Apanteles melanoscelus* Ratz., and certain other introduced Hymenopterous parasites are known to attack the caterpillars.

Artificial Control

Satin moth eggs may be killed by saturating the egg-masses with creosote, but only a part of them are readily accessible. Some are on the leaves and small twigs out of reach. Consequently, the best method of control is to spray the foliage with lead arsenate. It has been found that such applications in early June on alternate years, using 5 pounds lead arsenate and 1.25 pints fish oil, in 100 gallons of water, will control the satin moth and prevent serious defoliation.

Quarantine Revoked

For several years the movement of poplar and willow trees and shrubs and parts thereof have been restricted by both federal and state quarantines, which prohibited the shipment from the quarantined area to points outside. Because of the difficulty of detecting the presence of the satin moth larvae in their winter cases, no attempt has been made to inspect stock and certify it as free from infestation. Thus the quarantine has been an embargo, and has undoubtedly prevented the shipment of poplar and

[1] The Satin Moth, A Recently Introduced Pest. Bul. 1469, U. S. Dept. Agr. 1927.

willow trees from nurseries, but has not prevented the cutting, sale and distribution of pussy willow twigs by florists and individuals.

However, the pest has continued to spread and as it can readily be held in check by spraying, Federal Quarantine No. 53 against this insect was revoked, effective November 2, 1936. Consequently, the Connecticut State Quarantine Order No. 32, and all prior quarantines concerning the satin moth, were revoked by Quarantine Order No. 38, effective November 10, 1936.

Quarantine Order No. 38
Concerning the Satin Moth

Whereas Federal Plant Quarantine No. 53, first established and effective, January 1, 1922, and all later revisions and extensions, has been revoked, effective, November 2, 1936, there seems to be no further need of State Quarantine against the satin moth,

Now, therefore, I, William L. Slate, Director of the Connecticut Agricultural Experiment Station, under authority conferred by Section 2124, General Statutes, do hereby proclaim the provisions of Quarantine Order No. 32, and all prior quarantines concerning the satin moth, *Stilpnotia salicis* Linn., to be revoked.

This order shall become effective November 10, 1936.

(signed) W. L. Slate, Director,
Connecticut Agricultural Experiment Station

Approved:
(Signed) Wilbur L. Cross, Governor

Literature

Britton, W. E. The Satin Moth in Connecticut. Conn. Agr. Expt. Station, Bul. 285: pp. 264–267. 1926.
————————. Spread of the Satin Moth. Conn. Agr. Expt. Sta., Bul. 315, pp. 605–606. 1929.
————————. Spread of the Satin Moth. Conn. Agr. Expt. Station, Bul. 327, pp. 547–548. 1930.
————————. The Satin Moth. Conn. Agr. Expt. Station, Cir. 78, 4 pp. 1931.
————————. Poplar Trees Defoliated by the Satin Moth. Conn. Agr. Expt. Station, Bul. 360, pp. 474–476. 1933.
Brown, R. C. Observations on the Satin Moth and its Natural Enemies in Central Europe. U. S. D. A., Cir. No. 176. 1931.
Burgess, A. F. The Satin Moth, an Introduced Pest of Poplars and Willows. U. S. D. A., Dept. Cir. 167. 1921.
———————— and Crossman, S. S. The Satin Moth, A Recently Introduced Pest. U. S. D. A., Dept. Bul. No. 1469. 1927.
Collins, C. W. Control of the Satin Moth by Spraying in Alternate Years. U. S. D. A., Cir. No. 189. 1931.

TESTS OF APPLE SPRAYS

M. P. Zappe and E. M. Stoddard

Tests of apple sprays under commercial orchard conditions have been carried on coöperatively by the departments of Entomology and Botany at the station apple orchard at Mount Carmel. This orchard consists of approximately 168 trees of 13 varieties. Among them are 40 McIntosh and 32 Baldwin and from 4 to 14 each of the other 11 kinds. The plots were so arranged that McIntosh and Baldwin trees were separated.

The McIntosh plots all received sprays that contained sulfur to control apple scab. The Baldwin and other variety plots were sprayed with lead arsenate and hydrated lime, and a different sticker was used on each plot.

Several juniper trees that were heavily infected with cedar rust were planted between the Wealthy trees so that the leaves and fruit would become infected. Then the plot was given a special spray of lime sulfur and Casco glue to control the scab. As frequently happens in experimental work, the Wealthy trees bore no fruit so that no conclusions could be drawn as to the effectiveness of the sprays; and the leaves were only slightly infected with cedar rust so that no data could be obtained in this respect.

Time and Number of Spray Applications

No dormant or delayed dormant sprays were applied to this orchard in 1936, nor have any been used here for a number of years. On May 1 a prepink spray was applied on the McIntosh variety. The pink spray was given the entire orchard on May 7 and 8. The next treatment, or calyx spray, was on May 15 on McIntosh plots, and on May 18 in the rest of the orchard. The first cover spray was on May 26-27, second cover spray, June 3, and the final spray was applied on July 10 on all plots and consisted only of lead arsenate and hydrated lime without fungicide or sticker.

Sulfur Plots

These plots are made up mostly of McIntosh trees but there are also Stark, Gravenstein and Fall Pippin represented. This section of the orchard was divided into three plots. The basic spray for all consisted of 3 pounds of lead arsenate in 100 gallons of water. In addition one plot was sprayed with 6 pounds of dry lime sulfur and 4 pounds of catalytic sulfur per 100 gallons of the above spray; the second received another sulfur compound called Sulcoloid, 12 pounds per 100 gallons; while the third was sprayed with flotation sulfur, 5 pounds per 100 gallons. All plots received a complete schedule of the above named materials, no lime sulfur being used in early sprays on wettable sulfur plots.

TABLE 9. SULFUR PLOTS. MCINTOSH

3 lb. lead arsenate + 100 U.S. gals water + 4 lb.	Dry lime sulfur and catalytic sulfur	12 lb. Sulcoloid	5 lb. Flotation sulfur	Check no treatment
Good	88.74	93.43	87.6	.82
Curculio	6.54	2.74	10.09	73.03
Codling moth	.04	0.0	.15	.58
Other chewing insects	1.45	.88	1.08	29.86
Scab	3.66	3.03	1.35	53.44
	100.43	100.08	100.27	157.73

It may be seen from Table 9 that there was not very much difference in the control of apple scab by any of the fungicides employed. Flotation sulfur had the lowest percentage of scabby apples but had the greatest amount of curculio injury. This may be due to the fact that these trees were small and were not bearing very much fruit. The prepink spray was put on in time to give protection during the major period of scab infection for the year, May 3 and 4, and from the above data we may conclude that timeliness and thoroughness of application is as important as the material used.

Lead and Lime Plots

These plots were made up of a large number of varieties. Baldwin trees were present in each but there were no McIntosh and therefore there was no need for a very powerful fungicide for control of apple scab. This section of the orchard was divided into three plots and each was sprayed with

3 pounds of lead arsenate, 10 pounds of hydrated lime and 100 gallons of water. The difference in the sprays was in the sticker employed. One plot had fish oil, 1 quart; another, Casco glue, 4 ounces; and the third had colloidal fish oil, 1 pint to 100 gallons. No sulfur or other fungicide was used on these plots.

TABLE 10. LEAD AND LIME PLOTS. BALDWIN

	Fish oil	Glue	Colloidal fish oil	Check no treatment
Good	95.24	93.2	93.24	15.93
Curculio	2.86	3.68	3.66	42.85
Codling moth	.002	.001	.002	1.98
Other chewing insects	.59	1.12	1.42	25.67
Scab	1.32	2.07	1.92	20.07
Sooty blotch	0	0	0	30.97

After scoring the fruit at harvest time it was found that the percentage of good fruit was very nearly the same in all plots, as shown in Table 10, the differences being insignificant. The amount of curculio damage was the lowest ever recorded from this orchard. An adjoining peach orchard has had practically no fruit for two years until 1936, when a good crop was obtained. It may be that the normal curculio population was attracted from the apple to the peach orchard this year. No fungicide was used in this section but apparently the sprays used had some control over fungous diseases. Apple scab was present to a certain extent on the sprayed fruit, slightly over 2 percent on one plot, but the check plot had about 20 percent. In most cases the scab on the fruit was in the form of small spots, hardly any of them more than one-quarter inch in diameter. Sooty blotch was controlled perfectly, being reduced from nearly 31 percent in the check plot to nothing in the sprayed plots.

TABLE 11. LEAD AND LIME PLOTS

	FISH OIL Baldwin Greening Russet	GLUE Baldwin Greening N. spy King	COLLOIDAL FISH OIL Baldwin Greening N. spy King	CHECK
Good	94.66	92.5	91.98	10.2
Curculio	2.81	3.53	2.99	48.89
Codling moth	.02	.03	.02	3.88
Other chewing insects	.76	1.26	1.29	41.6
Scab	1.39	2.79	3.95	14.93
Blotch	.4			27.67

Table 11 gives the combined results from most of the varieties represented in these plots. They differ little from results obtained from Baldwin trees alone. It would seem that for most Connecticut orchards the above sprays will control insects and fungous diseases in an average year provided that no scab-susceptible varieties are included in the program.

One other advantage of the sprays containing no sulfur was very noticeable in 1936. In orchards where they were used, there was no injury by the European red mite. In many other orchards sprayed with materials containing forms of sulfur, there were serious infestations of these pests, said to be due to the fact that red mite enemies had been killed by the sulfur sprays.

FURTHER NOTES ON *CALOMYCTERUS SETARIUS* ROELOFS

M. P. Zappe

At the present time there are seven known infestations of *Calomycterus setarius* Roelofs in five different towns in Connecticut. The oldest is at Lakeville in the town of Salisbury and was discovered in 1932. An examination of this locality was made in the summer of 1936 and apparently there had been very little if any increase in the number of weevils.

In the town of Sharon, there are three separate infestations, several miles

Figure 52. *Calomycterus setarius*, adult weevil. About 15 times natural size.

apart, which may be part of one large infestation. They were found in 1935 but insects had been observed during preceding seasons. Although there were many weevils present in 1936, they were not much more abundant than in 1935.

Figure 53. Larva of the strawberry crown girdler, *Brachyrhinus ovatus*. About 15 times natural size.

The infestations in Greenwich and Stratford were also discovered in 1935. In Greenwich the infestation is very light and only a few beetles could be found feeding on Lespedeza in the summer of 1936. At Stratford at least

a square mile of land is infested and adults were much more abundant than in 1935, according to the people who live in the area.

A new infestation was found this summer in the town of Fairfield. Not much is known about it except that a moderate number of adults were feeding on clover. (See Figure 52).

As practically nothing is known about the immature stages of this insect, an attempt was made to find the larvae. Soil was sifted from various localities and from around a number of plants in the heavily infested Stratford area. A few grubs were found nearly everywhere but they appeared to be most abundant among roots of goldenrod. Later, grubs were plentiful in hay fields among grass and clover roots.

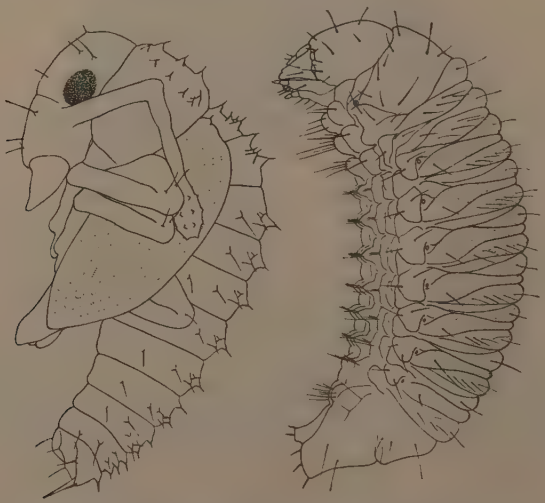

FIGURE 54. Pupa (left) and larva (right) of *Calomycterus setarius*. About 15 times natural size.

Two kinds of larvae were found and separated. These were sorted out mainly by color, as they varied in size only from one-sixteenth to one-eighth inches in length. One variety was pure white (see Figure 53) and turned out to be *Brachyrhinus ovatus* Linn., and the other was a dirty white or grayish color and proved to be the larvae of *Calomycterus setarius*, shown in Figure 54. They were placed in rearing cages and later adults of the above-mentioned weevils emerged from the soil. Grubs were dug and reared from other localities but all proved to be *Brachyrhinus ovatus*, except those collected at Stratford and Sharon. As many as 60 larvae per square foot of soil were found in some places.

The first pupae of Calomycterus (see Figure 54) were found in the soil on June 10, and on June 16 a few soft adults were present. On the latter date, 57 percent of the immature forms were pupae, and on June 23, 80 percent had entered that stage. At this time adults were abundant on *Lespedeza capitata* and *Desmodium canadense*. No larvae were found in the ground on June 30, but a few pupae were still present. Larvae were usually found from one to three inches deep in the soil, but pupae were much nearer the surface, just barely under ground, and could often be found by pulling up the grass roots without any digging.

The adults are attracted to houses, where they often become a nuisance by crawling up the sides and also getting into the buildings through doors and windows. Although adults began to emerge about the middle of June, none could be found on houses until July 7. From that time until mid-August they were plentiful on the sides of houses at Stratford. During July and August weevils were abundant on many kinds of vegetation, especially Lespedeza, where they caused partial defoliation (See Figure 55). Apparently they are fond of leguminous plants, as many were found feeding on several species of clover. At Sharon, adults were swarming over and into a house on July 10, and were also plentiful on clover and grass in a meadow near the house. Dissection of adults showed that the eggs were mature in greatest numbers between July 15 and August 15, and that specimens from houses contained about as many eggs as those collected from the field. The

FIGURE 55. Leaves of bush clover, *Lespedeza canadensis*, eaten by *Calomycterus setarius*. Greatly reduced.

height of egg deposition probably occurs during this period. Collections of adults were made at weekly intervals. The numbers of adults began to decrease after August 20, although specimens were taken up to October 5.

Apparently eggs of Calomycterus hatch soon after being laid, as small grubs were sifted from soil at the Stratford infestation during the last week in September.

Although the adults are wingless, there is a good chance of their spreading rather rapidly, especially from the Stratford infestation. This is situated on the shore of Long Island Sound, and during the time that adults are present many persons from all parts of the State visit this area. Picnic and beach parties park their cars where Calomycterus adults are plentiful,

and as the weevils crawl up on anything, they can gain entrance to automobiles very easily. They get on the clothes of people who walk across the meadow to and from the beach. As far as we have been able to find out, this insect is parthenogenetic and all adults are females capable of laying eggs, which in turn will eventually produce more females. It is therefore necessary to transport only one adult which under favorable conditions may start a new infestation.

CONTROL OF LEAFHOPPERS ON DAHLIAS

NEELY TURNER

The potato leafhopper (*Empoasca fabae* Harris) has caused much injury to dahlias during the past few years. The plants are attacked late in June and eggs and nymphs are abundant during July and August. Both nymphs and adults feed on the plant sap by puncturing the leaves, which causes a

FIGURE 56. Dahlia leaves mottled following leafhopper infestation. Somewhat reduced.

distinct mottling followed by leaf-curling and later by tip-burn. (See Figure 56). Usually the damaged leaves on the lower part of the stem die in August. (See Figure 57). In some varieties the top becomes very bushy and the blossoms are small and of poor color. Pompons have been more seriously injured than decorative varieties, and single-flowered types are more susceptible than double types. In general, the vigorous growing varieties, such as Jane Cowl, Jersey's Beauty, and Mrs. I. de Ver Warner, are not seriously damaged.

In 1933, pompon dahlias grown on the station farm at Mount Carmel were seriously stunted by leafhoppers. Repeated applications of nicotine sulfate and soap failed to reduce the infestation and few of the plants produced any blossoms. In 1934, leafhoppers were abundant again, and seriously injured the plants. On August 9, an application of 4-4-50 Bordeaux mixture was made and the plants showed an improvement immediately. The new growth was normal and no further tip-burn appeared. A second application was made on August 30. The plants continued growth and blossomed normally. In 1935, a similar spray schedule was followed and the results were satisfactory

FIGURE 57. Dahlia plants infested with leafhoppers, causing them to become bushy and lose their lower leaves.

In 1936, three materials were used. Plots were sprayed with Bordeaux mixture, and others dusted with talc, according to the suggestion of McDaniel[1], and with derris dust, .6 percent rotenone, clay carrier. The derris dust was not effective, but the talc dust apparently prevented serious injury. Plants sprayed with Bordeaux mixture on July 13, 25 and August 7 were least damaged by the leafhoppers. The dusts were applied July 13 and 25, omitting the August 7 application in order to avoid conflict with experimental sprays to control the European corn borer. The talc dust was very inexpensive and more easily applied than the Bordeaux mixture spray.

[1]McDaniel, E. I. Control of Potato Leafhopper, *Empoasca fabae*, on Dahlia with Flour, Talc and Infusorial Earth. Jour. Econ. Ent., 29: 464. 1936.

OBSERVATIONS ON THE EUROPEAN RED MITE AND ITS CONTROL

PHILIP GARMAN

The serious outbreak of the European red mite during 1936 demanded consideration of the cause and possible remedies. In general, commercial control was considered unsatisfactory and outbreaks occurred in orchards employing recommended sprays. It was discovered during July that enemies were unusually scarce with the exception of the mites belonging to the family Parasitidae (Gamasidae), such as *Seius pomi* Parrot, and related species. In the present discussion, "mite enemies" refers only to the above named predators. The following observations give a general picture of the condition in Connecticut during 1936:

1. Unsprayed trees showed little or no foliage bronzing.

2. Trees not sprayed or dusted with sulfur, but sprayed with lime, lead arsenate and fish oil or other sticker showed little or no bronzing.

3. Orchards sprayed with tar-lubricating oil followed by the usual sulfur applications showed serious infestations.

4. Orchards sprayed with dormant lubricating oil followed by lime sulfur in the regular schedule were seriously infested in some cases.

In connection with the foregoing it was found that:

1. Seriously infested orchards showed almost no mite enemies in July.

2. Orchards having red mites and abundant mite enemies showed no bronzing.

3. In July orchard tests, lime sulfur, flotation sulfur, dry and liquid lime sulfur all reduced the mite enemies more than lime, lead arsenate or summer oil. Dormant oils did not eliminate these enemies when no sulfur sprays followed.

In the station experimental orchard at Mount Carmel, where trees were sprayed with various dormant oils and followed by sprays consisting of lime, lead arsenate and fish oil or other sticker, no bronzing of importance occurred. However, red mites did build up on McIntosh trees where lime sulfur sprays were used. In another orchard less than one-quarter of a mile distant, where trees were sprayed with dormant oils and followed by a complete schedule using wettable sulfur as a fungicide, a serious infestation developed. This was checked only by application of summer oils. Several trees in this orchard, sprayed only at the pink stage with wettable sulfur and lead arsenate, remained green throughout the summer even though adjacent to heavily infested trees. As a matter of course, the check trees were examined for mite enemies. Many were found but they were scarce on trees alongside receiving more sprays.

If sulfur is omitted, the question regarding the possibility of scab control is important. The following figures from the records of Messrs. Stoddard and Zappe, covering their Mount Carmel experiments, show what has been done there with non-sulfur sprays during the last four years. Although it is true that satisfactory control of scab on the less susceptible varieties has been consistently obtained in this orchard, the practice is not recommended where scab is serious. It may be possible, however, to substitute the lime, lead arsenate, fish oil program in place of a wettable sulfur after the early season applications, thereby lessening the danger of burn from summer oil sprays in case they are needed for red mite control.

TABLE 12. SCAB CONTROL IN MOUNT CARMEL ORCHARD

Year	Percent scab on[1] unsprayed McIntosh	Percent scab on trees[2] sprayed with lime, lead arsenate and fish oil - no sulfur
1933	—	.69
1934	5.9	1.37
1935	60.92	.13 to .47
1936	53.45	1.3 to 2.0

[1]Indicates the severity of the infection on susceptible varieties.
[2]Baldwin, Greening, Fall Pippin, Spy, King and Sutton.

In connection with other mite investigations, Mr. Townsend began systematic observations and leaf counts in a Lebanon orchard where continued outbreaks from year to year have been reported. The counts were made by selection of a number of trees from each plot of about two acres, collecting leaf samples in a systematic manner and bringing them to the laboratory in New Haven. The leaves were placed in refrigeration, 38° F., on arrival. Only eggs were counted in the work since the larvae, nymphs and adults wander from the leaves on which they are collected, and counts of these stages would be inaccurate by our method.

The data shown graphically in Figure 58 indicate a considerable variation from plot to plot and explanations for this phenomenon are not entirely satisfactory. The plot showing most rapid increase is that where delayed dormant lime sulfur was used and this followed with dry lime sulfur summer applications. The plot in best condition was treated with a dormant oil and followed by lime sulfur up to the calyx period, after which wettable sulfur was substituted. In some of the plots the mite population continued high from the middle of June until the middle of August, in another from July to August, and in one (russet plot) reached outbreak proportions only during August. It was noted that mite and other enemy populations in this orchard were very low in July, but increased in some of the plots towards late summer.

For summer control of the European red mite and its eggs, a series of sprays were applied at the Connecticut State College orchard through the courtesy of Professors Hollister and Dunbar, and a smaller series at the Mount Carmel farm. In these tests, summer oil emulsions with 1 to 1.5 percent oil content were equal or superior to other materials. Sheep dip proved inferior both at the college and at the Experiment Station farm. An effort was made to increase the kill of summer eggs by addition of a thiocyanate to the oil. This effort was apparently successful at the State College orchard, but was not so successful at Mount Carmel. Derris powder incorporated in two of the regular sprays at Lebanon failed to give the desired control.

It became apparent from orchard observations that wherever the infestation became serious in late June or early July more than one summer oil application may be needed to control it. It is believed that under these conditions applications about one month apart will be satisfactory. It is not known, however, whether more than two sprays will ever be required, though in the worst cases observed this year only two were needed. In view of the leaf scorch which follows a summer oil preceded by lime sulfur, it is probably desirable to wait one month following a lime sulfur spray before a summer oil may be applied safely. Following a wettable sulfur, a

much shorter interval may be allowed. In our experiments only minimum leaf scorch resulted when sprays were applied after two weeks.

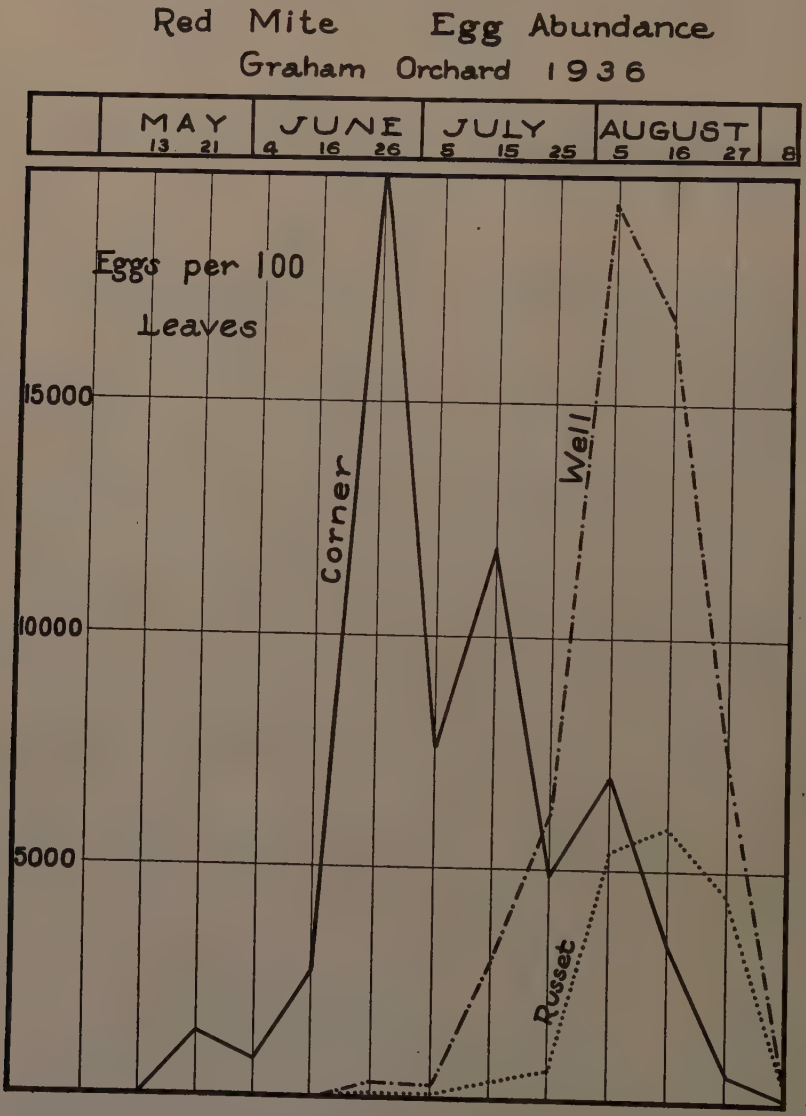

FIGURE 58. Chart showing results of mite sprays.
——— Corner lot. Dormant, lime sulfur; summer, dry lime sulfur, derris.
—·— Well lot. Dormant, flotation sulfur; summer, flotation sulfur.
····· Russet lot. Dormant, oil; summer, lime sulfur to calyx, then flotation sulfur.

Discussion of the Mite Predator Problem

It has been maintained by many workers that European red mite enemies are destroyed by various spray mixtures. Probably the most extensive work

along this line is that of Gilliat (1935) who examined a number of predators occurring in Nova Scotia. Laboratory tests with *Seius pomi*, considered the most important, indicated that Bordeaux mixture, lime sulfur with iron sulfate or aluminum sulfate and oils were effective in destroying them. Nicotine sulfate apparently was without effect. In these tests, lime sulfur, 1 to 40, killed 25 percent of the Seius present in 48 hours, whereas 3 percent Sunoco oil killed 100 percent within the same period. This author, however, admits that many predators may be concealed during the dormant period and might escape. In a previous statement (1935, p. 28), the author states that "dormant oil not only destroys most of the winter eggs of the European red mite, but also kills the larger proportion of the hibernating adults of *Seiulus pomi* Parrott, thus largely removing probably the most important natural controlling factor".

Whether the mite enemies were completely destroyed by our oil applications this year is not certain, though it is evident that the population built up rapidly where no sulfur applications followed. Likewise, it is possible that our temperatures in Connecticut during midsummer are enough higher than those prevailing in Nova Scotia so that a more rapid kill from sulfur is obtained. Just why lime sulfur without iron or aluminum sulfate is relatively harmless to Seius in Nova Scotia is not apparent, though it may be because of increased adhesive properties of the lime sulfur from addition of the sulfates as well as action of the sulfates themselves. Our lime sulfur sprays were applied entirely without added adhesive or other agents and still there was a striking reduction in mite enemies from their use in the field.

It has been observed by various workers in Connecticut and elsewhere in the United States (Sanders 1928, and Frost 1924) that sulfur dust often promotes European red mite outbreaks. Why, then, should wettable sulfur and lime sulfur be free of such action? It may be maintained that the reason lime sulfur serves generally as a better control in early season sprays depends not so much on the immunity of the mite enemies as on the increased kill of certain stages of the red mites themselves.

In regard to oils, our counts indicate that tar oils and oils containing cresylic acid reduced the mite enemy population more than other oils, but we still had an effective number this year on trees receiving no additional sulfur sprays. In this connection it should be stated that trees in the same series, sprayed with dormant lime sulfur and without subsequent sulfur sprays, likewise showed an adequate number of enemies in July. It is believed, therefore, that although some of the mite enemies are doubtless destroyed by dormant oils and dormant lime sulfur, enough may escape to make an effective control if they are not further depleted by later sprays. The advantage of dormant oil over dormant lime sulfur lies, of course, in the increased egg kill. On the other hand, with a control program allowing natural enemies to increase normally, it is believed that even the dormant oil may be discarded after the mite enemy population has developed sufficiently to take care of the situation.

TABLE 13. SEIUS POPULATIONS IN DIFFERENT LOCALITIES, 1936

Location	Date	Number leaves	Number Seius	Number per 100 leaves	European red mite infestation
New Haven					
Station Grounds	August 8	10	25	250	Present—no injury
No sulfur spray		10	16	160	Present—no injury
Mount Carmel					
Station Orchard	July 27	15	33	220	Present—no injury
"Young orchard"		15	45	300	Present—no injury
No sulfur spray		15	56	373	Present—no injury
Mount Carmel					
Station Orchard	July 30	15	19	126	Present—no injury
"Old orchard"					
Check tree[1] (1 sulfur spray)					
Mount Carmel					
Station Orchard	July 30	15	0	0	Present—severe injury
"Old orchard"					
Sprayed with					
wettable sulfur					
Hamden					
Peck Orchard	July 31	15	17	113	Present—no injury
Sprayed 6% oil,		15	10	66	Present—no injury
no subsequent spray					
Hamden					
Townsend Orchard	July 31	303	4	1.3	Present—severe injury
Sulfur spray[2]					
Hamden					
Townsend Orchard	July 31	295	147	49	Present—no injury
Unsprayed					
Lebanon					
Graham Orchard	July 15	184	0	0	Present—injury noted
Sulfur spray					throughout the orchard
Lebanon					
Trees nearby	July 15	50	54	108	Present—no injury
Unsprayed					
Branford					
Plant Orchard	August 21	29	13	44	Present—no injury
Sulfur spray[3]					

[1]Check tree had one flotation sulfur-lead arsenate spray at the pink period.
[2]A wettable sulfur containing some copper.
[3]This orchard was one of the few escaping red mite injury which had a full sulfur schedule.

TABLE 14. OBSERVATIONS ON THE EFFECTS OF DORMANT SPRAYS ON RED MITE ENEMIES. EXAMINATION DURING JULY.

Orchard and materials used	Number leaves examined	Number Seius	Number per 100 leaves
Peck Orchard,			
6% tank mix oil,	15	17	113
no subsequent sulfur spray	15	10	66
Station Farm, young orchard,			
Kleenocil[1] dormant, lime-lead arsenate	15	23	152
Station Farm, young orchard,			
Lime sulfur-nicotine sulfate dormant;	15	33	220
lime-lead arsenate following			
Station Farm, young orchard,			
Ready mix oil[2] emulsion dormant,	15	45	300
lime-lead arsenate following			
Station Farm, young orchard,			
Tar oil dormant, lime-lead	15	23	152
arsenate following			
Same as above	15	20	132
Check—no dormant oil or other spray.	15	56	372
Lime-lead arsenate following			

[1]Dormant oil containing cresylic acid [Commercial].
[2]Dormant oil without cresylic acid [Commercial].

TABLE 15. EFFECTS OF VARIOUS INGREDIENTS OF STANDARD SPRAY MIXTURES ON RED MITE ENEMIES. TOWNSEND ORCHARD, HAMDEN, 1936.

	Spray used	Number Seius before spray	Number Seius after first spray	Number Seius after second spray
1.	Lime, 5 lbs. to 100 gals. water	320	176	168
	Lime, 5 lbs. to 100 gals. water	214	322	160
2.	Lead arsenate, 3 lbs. to 100 gals. water	102	156	28
	Lead arsenate, 3 lbs. to 100 gals. water	40	102	40
3.	Flotation sulfur (dry), 5 lbs. to 100 gals. water	73	48	4
	Flotation sulfur (dry), 5 lbs. to 100 gals. water	33	8	0
4.	Dry lime sulfur, 6 lbs. to 100 gals. water	111	16	0
	Dry lime sulfur, 6 lbs. to 100 gals. water	32	12	0
5.	Liquid lime sulfur, 2 gals. to 100 gals. water	46	4	0
	Liquid lime sulfur, 2 gals. to 100 gals. water	78	8	0
6.	Check—no spray	94	148	150

Figures in the table represent the number of mite enemies per 100 leaves.
First examination July 16-17.
Spray applied July 21.
Second examination shortly after spray had dried.
Second spray August 1.
Third examination August 3 and 4.
Two trees selected for each experiment. Leaves up to 50 in number selected from each tree and examined with binocular.

Summary

Sulfur sprays may destroy European red mite enemies belonging to the mite family Parasitidae (Gamasidae).

Control of scab entirely without the use of sulfur has been demonstrated for some varieties by the experiments of Zappe and Stoddard of this Station.

White or summer oil emulsions are equal in effectiveness to any material tried so far for midsummer control and more effective than summer strength lime sulfur.

Severe infestations beginning in June may require two oil applications about one month apart. August outbreaks so far have required only one.

A discussion of the mite predator situation as it affects red mite abundance is given.

Literature

1. Anderson, H. W. Results of Disease Control in 1932. Trans. Ill. State Hort. Soc., 66: 175–197. 1932.
   (Effect of lime and lead arsenate in scab control)
2. Folsom, Donald. Maine Agr. Expt. Station, Bul. 380: 213-214. 1935.
   (Effect of lead arsenate and other materials on scab)
3. Frost, S. W. Four Year Experiment on the Control of the Red Spider. Jour. Econ. Ent., 17: 103. 1924.
   (Observation on effect of sulfur dusts)
4. Gilliat, F. C. Some Predators of the European Red Mite *Paratetranychus pilosus* C. and F. in Nova Scotia. Can. Jour. Research, D. 13: 19–38. 1935.
   (Thorough study of the predators of the European red mite)
5. Houser and Cutright. 47th Ann. Rept. Ohio Agr. Expt. Station, Bul. 431: 73. 1929.
6. Sanders, J. G. Observations on the European Red Mite. Jour. Econ. Ent., 21: 314. 1928.
   (Observation of effect of sulfur dusts)
7. Zappe, M. P., and Stoddard, E. M. Tests of Apple Sprays.
   Conn. Agr. Expt. Station, Bul. 360: 447–448. 1933.
   Conn. Agr. Expt. Station, Bul. 368: 210–212. 1934.
   Conn. Agr. Expt. Station, Bul. 383: 305–308. 1935.
   (Results with lime, lead arsenate and fish oil for control of scab)

WORK WITH ORIENTAL FRUIT MOTH PARASITES

PHILIP GARMAN

Breeding and distribution of fruit moth parasites was continued in 1936 by Messrs. Brigham, Schread and Smith, with the result that 16,118 individuals of *Bassus diversus* Mues. were liberated in 43 orchards. Twelve of these colonies consisted of 500 or more females, 14 from 300 to 500 females, and the remainder of 100 to 300. Liberations this year also included 3,825 individuals of *Dioctes molestae* Uchida, the Korean parasite, of which 1,781 were females. These were liberated in 20 orchards. There were also 5,213 individuals of *Macrocentrus ancylivorus* Roh., with 2,550 females placed in 14 colonies, and 12,000 of *Perisierola angulata* Mues. in 20 colonies. In addition, the Federal Bureau of Entomology and Plant Quarantine placed 1,181 individuals of eight different foreign species in several different localities. Six of the species liberated by the Federal Bureau were new to the State, never having been released here before.

Collections of infested twigs from various orchards during June and July showed a low population of fruit moths in June and a low parasitization by larval parasites in July. In view of the low parasitism in July we predicted a heavier fruit moth infestation than had occurred for several years. Although this prediction did not hold generally, there was, nevertheless, a heavy infestation in Hales and in some cases also in Elbertas, in many localities.

Recovery of recently introduced parasites was attempted. *Dioctes molestae* was obtained from collections at the Bishop orchard in Cheshire under conditions which lead us to believe that it wintered successfully during 1936. *Bassus diversus* was obtained in another orchard, but recoveries of both species were so limited that no predictions can be made regarding their ultimate survival in Connecticut. Attempts to recover other foreign parasites liberated have so far been unsuccessful.

A stock of *Phaeogenes haeussleri* Uchida, has been obtained from the Bureau of Entomology and Plant Quarantine with a view to liberating them in Connecticut during 1937. Breeding work is proceeding satisfactorily at the present time. This is a pupal parasite, originating in Japan and said to be of some value as a fruit moth parasite in that country.

About 13 million Trichogramma were reared during 1936, 11 million going to peach growers and the remainder being held for the corn borer experiment reported elsewhere by Mr. Schread. The work of distribution was done in coöperation with the Connecticut Pomological Society through its committee on peach moth parasites.

FURTHER STUDIES IN CONTROL OF THE APPLE MAGGOT

PHILIP GARMAN

Continued laboratory work in the control of this insect was carried out as well as several field experiments. Cage tests were conducted using flies confined with sprayed apples, and kept in a room conditioned to 76° F. and 60 to 70 percent relative humidity. The tests were continued for 20 days and the apples replaced with freshly sprayed fruit after 10 days. Flies were held for one day after emergence before introduction of the sprayed fruit in order to eliminate mortality due to handling newly emerged

individuals. The materials used were evaluated for: (1) Efficiency in preventing oviposition and (2) killing value or increase in mortality over check cages.

In general the results obtained this year indicate that derris is a very good insecticide for killing apple maggot flies and, as seen from the table, kills much more rapidly than lead arsenate. This rapid kill is also reflected in egg puncture reduction which amounted to 99 percent when used as a spray at the same rate as lead arsenate. Small amounts of derris or allied material in the form of a .75 percent rotenone dust applied so as to cover the fruit surface in a very light layer were also effective in killing the flies and preventing oviposition. Phenothiazine continued to show repellent action but did not equal the killing effect of either derris or lead arsenate. Wheat flour was used as a carrier in all tests except the rotenone dust, the sprays being applied at the rate of 3 grams poison and 3 grams flour in 800 cc. water.

In general, results of the laboratory tests mentioned confirm those reported last year (Bul. 383 of this Station, p. 315). This year, with smaller dosages and slightly different technique, the derris appeared to have advantages both in kill and egg puncture reduction whereas previously reported tests indicated that lead arsenate had a slight advantage. The effect of rotenone dust in cage tests is interesting as indicating a possible field control of some value.

Lime-glue sprays used in three field experiments again this year gave favorable results in one test and unfavorable results in the other two. There is still some indication of repellent action where this mixture is employed, but it is believed some killing agent is needed in addition. Examination at harvest of apples sprayed with phenothiazine and wheat flour, 3 pounds each in 100 gallons, showed results comparable with calcium arsenate, but further tests will be needed to establish its true value. Apparently the repellent action noted in cage tests remains in the field over a long period. Apples sprayed with derris showed up much better than a year ago, were as free from maggot injury as any in the orchard, and were much better than fruit from the check trees.

TABLE 16. LABORATORY EXPERIMENTS IN CONTROL OF APPLE MAGGOT FLIES, 1936–1937

Material	Spray or dust	No. tests	No. females used	Mortality in 20 days	Egg punctures per female
4% derris root	Spray[1]	3	104	90.9[2]	.68
.75 rotenone	Dust	3	134	100.0[3]	.18
Lead arsenate	Spray	4	82	84.1	3.3
Calcium arsenate	Spray	2	40	60.0	4.8
Basic zinc arsenate	Spray	2	45	71.1	3.7
Cryolite (Alorco)	Spray	2	33	54.5	4.6
Phenothiazine	Spray	2	59	57.6	7.9
Check	No spray	3	56	19.6	40.7

[1]Dilution given in text above.
[2]Mortality 100 percent in 14 days in two tests.
[3]Mortality 100 percent in 14 days in all tests.

NOTES ON CONTROL OF THE TENT CATERPILLAR IN ORCHARDS

PHILIP GARMAN

During 1936, a large number of tent caterpillar egg-masses were obtained and treated with dormant oils and lime sulfur mixtures in order to

find which are the most effective ovicides. After treatment, the eggs were hung in an open insectary exposed to outdoor conditions except rainfall. Results obtained and set forth in Table 17 show that lime sulfur, and oil with nicotine sulfate added, are two of the most effective sprays against the egg stage.

For the past two years several spray combinations have been tried in the peach orchard at Mount Carmel. Here, oils without nicotine were compared with lime sulfur preparations, and the number of tents developing per tree were noted later in the season. In these tests, lime sulfur proved the most effective agent as indicated in Table 18. Unfortunately, however, there was no comparative field test with dormant oil and nicotine sulfate combined.

During 1935, a practical demonstration of the effectiveness of lime sulfur as compared with oils was observed in a large commercial orchard in Wallingford. Part of this orchard was treated with lime sulfur dormant spray, whereas the remainder was treated with 6 percent tank mix oil emulsion. Few or no nests were seen in the block sprayed with the lime sulfur, but they were fairly numerous in the oil sprayed portion.

TABLE 17. TESTS OF VARIOUS MATERIALS TO KILL TENT CATERPILLAR EGG-MASSES, 1936. SPRAYED APRIL 1 AND HUNG IN THE INSECTARY WITH OUTDOOR CONDITIONS EXCEPT RAINFALL. EXAMINATION AFTER UNSPRAYED MASSES HAD CEASED TO HATCH

Materials used and dilutions	Total masses	Number hatched	Percentage showing emergence
Kleenup ready mix[1] 5% Lime sulfur 1 to 8, 12.5%	87	18	20.6
Lime sulfur 1 to 8, 12.5%	84	12	14.3
Kleenocil[2] 4½% (½% cresylic acid)	80	22	27.5
Kleenup ready mix 4% Nicotine sulfate .125%	84	5	5.9
Kleenup ready mix 4% Loro[3] 1 to 800	76	58	76.3
Diamond paraffin oil 6% Skim milk powder 1½%	64	56	87.5
Sunoco spray oil 5% Cresylic acid ½%	63	49	77.7
Sunoco spray oil 5% Loro .125%	70	57	81.4
Tar-lubricating oil 4.5% (Tar 2½) Turkey red oil .5%	50	33	66.0
Tar-lubricating oil 4.5% (Tar 2½) Diglycol oleate .5%	59	45	76.2
Lubricating oil 4½% Loro .25%	82	69	84.1
Tar oil 2½% Turkey red oil .5%	67	59	88.0
Check, no treatment	91	83	91.2

[1]Kleenup ready mix. Commercial oil preparation manufactured by the California Spray Chemical Co. 1936 product.
[2]Kleenocil. Commercial oil with cresylic acid manufactured by the California Spray Chemical Co. 1936 product.
[3]Loro. Lauryl thiocyanate manufactured by the Grasselli Chemical Co. 1936 product.

TABLE 18. EFFECT OF SPRAY MIXTURES ON TENT CATERPILLAR EGG-MASSES. PEACH ORCHARD, MOUNT CARMEL

Treatment	Number of trees	Number of tents	Number tents per 100 trees
	1935		
Bordeaux mixture 8-8-100	48	27	56
Lime sulfur 3 gals. to 100 / Kleenup 4 gals. to 100	24	3	12
Lime sulfur 1 gal. to 15	142	17	12
Check, no treatment	23	21	91
	1936		
Bordeaux mixture 4-4-100	44	282	638
Bordeaux mixture 4-4-100 / Miscible oil 5 gals. to 100	44	156	354
Lime sulfur 6 gals. to 100	127	114	89
Check, no treatment	19	85	447

NOTE ON FIELD AND LABORATORY CONTROL OF CANKER WORMS

PHILIP GARMAN

Apple trees at Mount Carmel, heavily infested with canker worm eggs, were sprayed March 30, 1936, with 6 gallons diamond paraffin oil, 3 pounds skim milk powder and 50 gallons of water.

Ten egg-masses were tagged and collected after all others had hatched in the orchard. Two of the 10 masses had hatched eggs. Of a total of 1,080 eggs in the masses, 137 or 12.7 percent hatched, giving a possible control of 87 percent.

A count of worms on 100 leaves by Mr. Townsend showed 5, 4 and 15 on trees that were sprayed, or an average of 8. On unsprayed trees in the vicinity, 20 and 47 canker worms per 100 leaves were counted, or an average of 33. According to this, there was a field control of approximately 75 percent. The control, however, was not sufficient to protect the trees, although, in general, those sprayed appeared to be in much better condition at the height of the infestation than unsprayed trees nearby.

Laboratory tests with canker worm eggs were also conducted during 1934 and 1935. The results obtained are shown in the following table. It would appear that heavy oil applications will afford some control of canker worms in the egg stage, but will not necessarily give satisfactory relief where no other measures are taken.

TABLE 19. LABORATORY TESTS OF MATERIALS TO KILL CANKER WORM EGGS, 1934 AND 1935. EGGS KEPT AT ROOM TEMPERATURES AFTER TREATMENT

Materials used	Dates	Total eggs	Hatched	Percent hatched
Lime sulfur 1 to 8	Feb. 14 to Mar. 4	302	231	76.5
Lime sulfur 1 to 8	Apr. 10 to Apr. 24	477	189	39.6
Lime sulfur 1 to 8 plus Nicotine sulfate 1 to 800	Feb. 14 to Mar. 4	127	102	80.3
Lime sulfur 1 to 8 plus Nicotine sulfate 1 to 800	Apr. 10 to Apr. 24	391	330	84.3
Lubricating oil 6% plus Areskap .5%	Mar. 4 to Apr. 5	256	3	1.1
Lubricating oil 4% plus Areskap .25%	Mar. 4 to Apr. 5	161	69	42.8

TABLE 19—CONTINUED

Materials used	Dates	Total eggs	Hatched	Percent hatched
Lubricating oil 6% Glycerol oleate .5%	Apr. 4 to May 4	515	12	2.3
Lubricating oil 6% Diglycol oleate .5%	Apr. 4 to May 4	552	0	0.0
Lubricating oil 4% Diglycol oleate .5%	Apr. 4 to May 4	370	14	3.7
Lubricating oil 4% Cresylic acid .5% Milk powder .5%	Mar. 4 to Apr. 5	201	89	44.2
Lubricating oil 6% Milk powder .5%	Mar. 4 to Apr. 4	202	8	3.9
Lubricating oil 6% Milk powder .5%	Apr. 4 to May 4	536	136	25.3
Sunoco spray oil 8%	Apr. 10 to Apr. 24	711	166	23.3
Sunoco spray oil 6%	Apr. 10 to Apr. 24	508	182	35.8
Dendrol 8%	Apr. 10 to Apr. 24	515	93	18.0
Dendrol 6%	Apr. 10 to Apr. 24	503	108	21.4
Check, no treatment	Feb. 14 to Apr. 4	149	141	94.6
	Apr. 10 to Apr. 24	242	201	83.0
	Apr. 4 to May 4	388	306	78.8

NOTE: Diamond paraffin oil from the Atlantic Refining Co. was used in tests where oil was employed, except for the commercial oils used.

REPORT ON PEACH SPRAYS

PHILIP GARMAN

Work reported in previous seasons was continued in an effort to obtain improved insecticides for the peach. Two brands of lead arsenate, one of high and one of low soluble arsenic content, were compared, using zinc sulfate and lime as a safener with wettable sulfur as the fungicide. Very little difference between the high and low water soluble lead arsenate could be seen in these experiments, but there appeared to be a slight advantage from the use of the low soluble material in amount of leaf scorch and drop. Examinations of trees sprayed with cryolite, and with lead arsenate, showed much less damage to the leaves and twigs wherever the cryolite was used. Dry flotation sulfur was used as the fungicide.

Examination of early drop fruits showed about the same curculio control for lead arsenate with zinc sulfate as for cryolite and sulfur, as shown in Table 20. Considering the variation, the differences do not appear significant. These results correspond with those obtained in 1933 in the same orchard. (See Bul. 360 of this Station, p. 455). Two applications for curculio control were made, one at the time of the shuck fall, May 29, and the other two weeks later.

During August and September, four sprays of derris with skim milk powder as the wetting agent were applied for fruit moth control, but examination of the fruit at harvest showed a low infestation of fruit moth and not enough difference between sprayed and unsprayed fruit to be significant. Two and one-half to three pounds of derris, 4 percent rotenone, was used in each 100 gallons of water. Much difficulty was encountered at this time in spraying the trees because they were loaded with fruit and the branches of neighboring trees were in contact with one another.

TABLE 20. CONTROL OF CURCULIO ON PEACHES, 1936

Treatment	No. trees sampled	Total examined	Infested	Average percent infested
Alorco cryolite	4	617	294	47.6
Natural cryolite	4	785	212	27.0
Lead arsenate	4	710	253	35.0
	4	836	491	58.0
Check—no curculio spray	4	788	559	70.9

EXPERIMENTS WITH CONTROL OF THE ROSY APPLE APHID

PHILIP GARMAN

Control of the rosy apple aphid on apple trees was attempted during 1936, using a number of materials offered for that purpose. Oils with cresylic acid, tar oils, and tar-lubricating oil emulsions were used at the dormant stage. A miscible oil was applied at the delayed dormant period. Of the materials used, the tar oils gave better controls than any other product. The failure of oil with cresylic acid is thought to be due to the fact that it was not applied late enough, but it should be remarked that the safety period for applications of this kind is often relatively short in Connecticut. Control with commercial tar-lubricating oil emulsions in several orchards in New Haven County appeared to be satisfactory as far as aphid control was concerned, but a disturbing element appeared in the serious outbreaks of European red mite during the summer in these orchards. Just how much influence the tar-lubricating oils had on this pest has not been fully determined though they are believed to have helped in the general reduction of natural enemies of the red mite.

At Westwoods, every other tree of a row of Cortland apples was sprayed with 2.5 percent tar oil emulsion, emulsified in the tank with fish oil soap. Results of the counts made during the season and at harvest indicate considerable reduction in aphid apples, centers of infestation, and aphids per 100 buds. The actual control, however, was not as good as might be expected from the kill of aphids earlier in the season. Similar results were obtained on Gravenstein in a nearby orchard but red mites did considerable damage there. The European red mite does not commonly damage Gravenstein in this locality.

At the Mount Carmel farm, the application of a miscible oil as a delayed dormant spray and oil plus cresylic acid as a dormant gave no advantage in aphid free fruit over check trees, whereas tar oils reduced the amount of affected fruit an average of 31 percent over checks. The reduction in the number of aphids per 100 buds is shown in Table 21, and results in the Westwoods orchard in Table 22.

TABLE 21. CONTROL OF THE ROSY APHID ON APPLE TREES.
EXPERIMENT STATION FARM, MOUNT CARMEL, 1936

Materials	Variety	No. trees	No. buds examined	Aphids per 100 buds	Period of application
	ORCHARD A				
Tar oil, 2.5 gallons Potash fish oil soap, 2.5 quarts Water, 100 gallons	Baldwin Gravenstein	3 2	150 50	4 4	Dormant
Commercial oil emulsion diluted to .5% cresylic acid	Baldwin Gravenstein	3 1	125 50	13 22	Dormant
Commercial oil emulsion 4% stock	Baldwin	3	150	18	Delayed Dormant
Check—no spray	Baldwin Gravenstein	13 2	650 100	70 113	
	ORCHARD B				
Miscible oil 5% stock	Greening	2	100	13	Delayed Dormant
5% oil emulsion stock plus .5% cresylic acid in diluted spray	Greening	2	100	12	Dormant
2.5% tar oil plus fish oil soap	Gravenstein Hurlbut	1 1	50 50	0 2	Dormant
2.5% tar oil plus Turkey red oil	Baldwin	6	320	4	Dormant
Tar oil 2.5% Lubricating oil 2.5% plus fish oil soap	Hurlbut	2	100	3	Dormant
Check—no spray	Baldwin Greening	2 2	100 90	55 95	

TABLE 22. CONTROL OF ROSY APHID ON APPLE.
J. F. TOWNSEND FARM, WESTWOODS, HAMDEN, CONN., 1936.
VARIETY CORTLAND. SPRAYED MARCH 30, EXAMINED APRIL 14.
APPLIED WITH POWER SPRAYER

Treatment	No. trees	No. buds	No. aphids	Aphids per 100 buds
Tar oil, 2.5 gallons Fish oil soap—(Spreadol), 3 quarts Water, 100 gallons	6	192	4	2
Check—no treatment	5	160	96	60

COUNT OF CENTERS OF INFESTATION, MAY 22

Treatment	No. trees	Centers	Centers per tree
Tar oil, same as above	6	14	2.3
Check—no treatment	5	135	27.0

EXAMINATION OF FRUIT AT HARVEST FOR APHIS APPLES. SCORE BY TREES SHOWING VARIATION FROM TREE TO TREE.

Tree	Treatment	Total apples	Aphis apples	Percent aphis apples
1		187	35	18.7
3		187	12	6.4
5		319	57	17.8
7	Tar oil	312	11	3.5
9		204	70	34.3
11		399	31	7.7
		1,608	216	13.4
2		77	21	27.2
4	Unsprayed	125	61	48.8
6		217	49	22.5
8		253	100	39.5
10		461	101	21.9
		1,133	332	29.3

NOTE: Trees small, probably not over 10 feet high. Sprayed carefully from all angles. No inter locking of branches.

STUDY OF SEVERAL NICOTINE PREPARATIONS AND WETTING AGENTS FOR INCREASING THEIR TOXICITY

PHILIP GARMAN

Appearance of numerous proposed spreading agents in the alcohol sulfate field and the successful use of such materials in experiments suggested comparing them with soap as wetters for *Aphis rumicis*. At the same time, several nicotine compounds not commonly used were prepared by Dr. H. J. Fisher of the Department of Analytical Chemistry of this Station, and these were examined along with the wetting agents mentioned.

It was noted in these experiments that a number of the alcohol sulfates were very good wetting agents for *Aphis rumicis* at 1 to 100 or 1 percent dilution, but at greater dilutions, such as 1 to 400, 500 or 1,000, the wetting ability dropped off rapidly and there was a corresponding decrease in aphid mortality.

The nicotine preparations were compared with nicotine sulfate and nicotine alkaloid on a nicotine content basis. Some of the preparations seemed to possess greater toxicity for *Aphis rumicis* than the sulfate, but the increase is probably not great enough to be of practical value. The toxicity of such compounds apparently depends largely on the nicotine content and can only be increased within narrow limits by changing the nature of the salts or by addition of different wetting agents.

Of the nicotine compounds prepared by Dr. Fisher, nicotine salicylate seemed to be the most promising. Nicotine hydrochloride is deliquescent, taking moisture from the air rapidly, and nicotine naphthenate has a strong odor besides other objectionable features. Nicotine salicylate, however, is an odorless crystalline material readily soluble in water or methyl salicylate and possesses good toxicity for *Aphis rumicis*.

The wetting agents tested are representatives of several groups offered to us for the purpose of combining with insecticides, but no attempt has been made to secure all the various kinds in these groups.

Following is a description of the materials used:

1. Nicotine hydrochloride, 81.6 percent nicotine: brown granular material, takes up moisture from the air; strong odor of nicotine preparations.
2. Nicotine salicylate, 54 percent nicotine: white crystalline powder, odorless.
3. Nicotine naphthenate, 40 percent nicotine: dark brown liquid, strong penetrating odor of naphthenes.
4. Nicotine sulfate, 40 percent nicotine: commercial preparation.
5. Nicotine alkaloid, 95 percent nicotine: commercial preparation.
6. Igepon A. P. Ex. Con., Oleate taurine: white powder.
7. Igepon T-gel, Oleate methyl taurine: colorless jelly.
8. Nekal 3 B, Sodium isobutyl naphthalene sulfonate: brown powder.
9. Areskap, Sodium sulfonate of orthophenyl phenol: brown powder.
10. Avirol, Sodium stearyl sulfate: white powder.

TABLE 23. APHID MORTALITY USING FIVE SPREADERS AND TWO NICOTINE COMPOUNDS OF KNOWN COMPOSITION FEBRUARY, 1936

Nicotine compound	Spreader and dilution		Number counted	Moribund and dead	Percent dead
Hydrochloride	Sodium oleate	1 to 800	152	152	100.0
Salicylate	Sodium oleate	1 to 800	114	113	99.1
Hydrochloride	Igepon A. P. Ex. Con.	1 to 800	150	134	89.3
Salicylate	Igepon A. P. Ex. Con.	1 to 800	81	75	92.5
Hydrochloride	T.-Gel[1]	1 to 800	175	151	86.2
Salicylate	T.-Gel[1]	1 to 800	80	73	91.2
Hydrochloride	Areskap	1 to 800	146	88	60.2
Salicylate	Areskap	1 to 800	111	86	77.4
Hydrochloride	Avirol	1 to 800	84	52	61.9
Salicylate	Avirol	1 to 800	137	114	83.2
Hydrochloride	None	——	98	72	73.5
Salicylate	None	——	115	81	70.4
Check	None	——	87	0	0.0
Check	None	——	121	1	0.8

[1] Original material contains 75% water. Dilution on a dry basis.
Nicotine content of solutions the same in all cases.
Aphids sprayed at 10 lbs. pressure with nozzle 9 inches from the leaf, which was placed on a revolving turntable. After spraying, the aphids were placed in an air conditioned room maintained at 76° F., 60 to 65% relative humidity.

TABLE 24. COMPARISON OF SEVERAL ALCOHOL SULFATES WITH SODIUM OLEATE FOR KILLING *Aphis rumicis*

Materials	Dilution	Number aphids	Dead and moribund	Percent killed
Sodium oleate C. P.	1–100	671	645	96.1
	1–200	711	662	93.1
	1–400	280	180	64.2
Igepon A. P. Ex. Con.	1–100	741	691	93.2
(Oleate taurine)	1–200	1,089	1,025	94.1
	1–400	336	207	61.5
Nekal 3 B	1–100	717	701	97.7
(Sodium isobutyl naphthalene	1–200	904	742	82.0
sulfonate)	1–400	346	195	56.4
Areskap	1–100	911	798	87.5
(Sodium sulfonate of	1–200	817	600	73.5
orthophenyl phenol)	1–400	358	139	38.8
Avirol	1–100	723	418	57.8
(Sodium stearyl sulfate)				
Check	——	437	22	5.0
		340	12	3.5
		201	15	7.4

Distilled water used in all tests.

TABLE 25. COMPARISON OF SODIUM OLEATE AND IGEPON A. P. EX. CON. SPREADERS FOR KILLING *Aphis rumicis*. NICOTINE DILUTION .00013 PERCENT

Spreader	Nicotine salt	Total aphids	Number dead	Percent dead
Sodium oleate 1 to 1600	Naphthenate	234	225	96.1
		291	273	93.8
Sodium oleate 1 to 1600	Salicylate	194	174	89.6
		269	230	85.5
Sodium oleate 1 to 1600	Sulfate	229	175	76.4
		113	96	84.9
Sodium oleate 1 to 1600	Alkaloid	241	205	85.0
		284	238	83.8
Igepon A. P. Ex. Con. 1 to 1600	Naphthenate	238	215	90.1
		200	157	78.5
		188	148	78.7
Igepon A. P. Ex. Con. 1 to 1600	Salicylate	168	140	83.3
		191	152	79.5
Igepon A. P. Ex. Con. 1 to 1600	Sulfate	263	215	81.7
		158	135	85.4
Igepon A. P. Ex. Con. 1 to 1600	Alkaloid	260	214	82.3
		216	198	91.2
Sodium oleate 1 to 1600	None	174	16	9.2
		189	15	7.9
Igepon A. P. Ex. Con. 1 to 1600	None	211	14	6.6
		107	21	19.6

Aphids sprayed and maintained after spraying as in Table 23.
Distilled water used in all tests.

THE HORNED SQUASH BUG, *Anasa armigera*, WITH A NOTE ON *Anasa repetita*

R. L. BEARD

The horned squash bug, *Anasa armigera* Say, is a common pest of cucurbits in the southern states.

Prior to 1936, the only record of this bug in Connecticut was of a single specimen taken in New Haven, June 26, 1919. In the summer of 1936, however, it appeared in sufficient numbers to be noticeable, but was not abundant enough to cause any damage to plants. This species was observed in plantings of summer squash in the towns of Hamden, Southington, and Thomaston. The greatest number was found on squash planted in cold frames on a truck farm in Hamden. Here the horned squash bug constituted 28.8 percent of all the squash bugs collected. On a truck farm in Southington, 6.5 percent were found, and in Thomaston, 2.5 percent.

Upon superficial observation, this species seems little different from the common squash bug, *Anasa tristis* DeG. It is somewhat lighter in color than the common species, and when in flight is conspicuous because of the red coloration on the dorsal surface of the abdomen. The abdomen is broader than in *A. tristis* and hence is not so completely covered by the hemielytra. Each lateral margin, or connexivum, has four prominent white spots and is seen to be reflected. The terminal segments of the antennae are red. The characteristic which gives the name to the bug is the presence of two spines or "horns" on the head, just behind the antennal tubercles. The prominent thoracic angles are another distinguishing feature.

The life history of this bug seems to be very similar to that of the common squash bug. Adults were first observed on May 29, about the time when *A. tristis* first appeared. On June 3, caged females laid their first eggs. Figure 59 shows egg-masses of both *A. armigera* and *A. tristis*. The eggs of the two species are about the same size, but those of *A. armigera* are somewhat narrower at the ends. Fewer eggs are laid per mass, and these are spaced further apart than those of the common species, at times being very widely scattered. They are of a bright, shining, copper color, whereas those of *A. tristis* are more of a dull bronze. There is apparently some environmental factor unfavorable to the oviposition of this species, for, although the appearance of the ovaries is practically the same as that of *A. tristis*, eggs in the field were fewer than would be expected from the estimated population, and comparatively few were obtained from bugs caged over potted squash plants. Of six caged females, two died without laying any eggs, and the greatest number of eggs obtained from any individual was 33. *A. tristis* females under the same conditions laid from

FIGURE 59. At left, eggs of squash bug, *Anasa tristis*. At right, eggs of *A. armigera*. Twice natural size.

55 to 184 eggs each. It may be that squash is not the favorite host plant. In 1918 Parshley, in Massachusetts, recorded extensive feeding on the wild cucumber, *Sicyos angulatus* Linn., and also on the cultivated cucumber. Of the bugs collected this year, however, all but two specimens were taken on squash. These two were taken on a cucumber plant adjacent to squash.

There are five nymphal instars, as in *A. tristis*, and the time of development from egg to adult is probably about the same in each case. An insufficient number of bugs were reared to get average figures, but one group completed its development in 58 days—from June 9 to August 6—with the time for each stage as follows: Egg, 16 days; first instar, 6 days; second instar, 7 days; third instar, 6 days; fourth instar, 8 days; and fifth instar, 15 days.

Chittenden (1899) has described the various stages of this bug in some detail, but since its appearance is so different from *A. tristis*, except in the adult stage, a brief description is given here.

All stages of nymphs, and even the adult form, are much more attractive than those of the common squash bug. When the bug first hatches from the egg, its body is clear white with brilliant red eyes and antennae and red bands on the white legs. The abdominal tubercles are orange, and fainter orange markings appear on the lateral margins of the dorsal surface of the abdomen. The head is grayish, darker on the sides than on the dorsal surface. The thorax is white except for gray markings on the dorsolateral portions of the metathorax. A few hours after hatching, the colored portions darken considerably. The abdominal markings remain light, however. In subsequent stages, immediately after ecdysis, the colored portions are bright, but darken somewhat after a few hour's exposure. This stage is about 2 mm. in length.

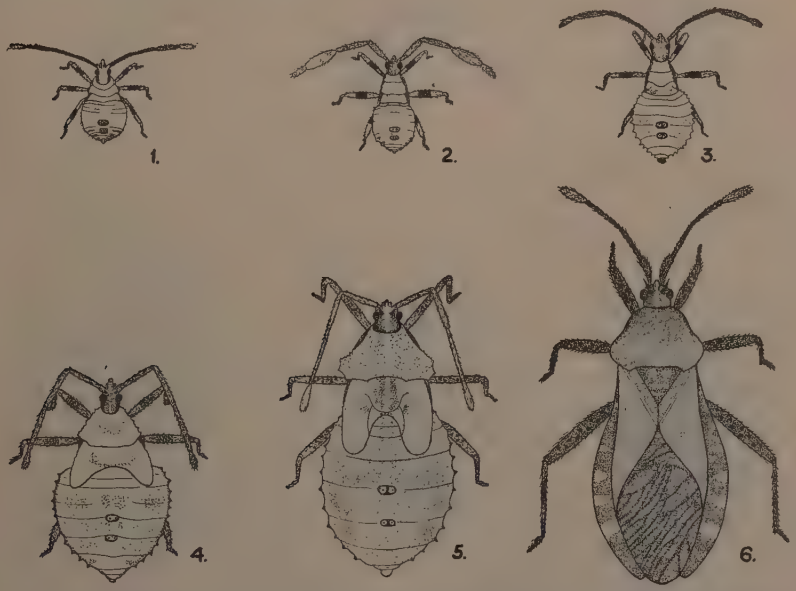

FIGURE 60. The horned squash bug, *Anasa armigera*. 1, first instar nymph; 2, second instar nymph; 3, third instar nymph; 4, fourth instar nymph; 5, fifth instar nymph; 6, adult bug. About three times natural size.

The second instar quite closely resembles the first but is somewhat larger. The most conspicuous difference is the increased width of the penultimate segment of the antennae. This instar measures about 3 mm. in length.

In the third instar the antennae and the banding on the legs become darker, and the penultimate antennal segments continue to be broad. The head also becomes darker in color. The wing pads are very slightly in evidence at this stage. The abdomen is considerably wider in proportion to the thorax, and the abdominal tubercles are dark. The margins of the abdomen are dentate, but less so than in the following instars. The length is about 5 mm.

In the fourth instar the horns behind the antennal tubercles first appear. The eyes continue to be bright red. The thoracic angles are rather prominent, and the wing pads are noticeable. The bandings on the legs are less distinct, but the location of black spots indicates their position. The sides of the abdomen are spotted with black, and their margins are strongly dentate in outline. This instar measures about 7 mm.

In the fifth instar the entire body of the nymph is mottled yellow and brown, with legs uniformly spotted with black. This nymph looks very much like the adult bug because of the pronounced thoracic angles. The wing pads are considerably larger and the spines at the base of the antennae are more prominent than in the fourth instar. The length is about

FIGURE 61. The common squash bug, *Anasa tristis*. 1, first instar nymph; 2, second instar nymph; 3, third instar nymph; 4, fourth instar nymph; 5, fifth instar nymph; 6, adult bug. About three times natural size.

9 mm. The developmental stages of *Anasa armigera* are shown in Figure 60, and corresponding stages of *A. tristis* in Figure 61.

Anasa repetita Heid. is another species of squash bug rarely reported in Connecticut. Five specimens of this were taken during the summer. Four were found in New Haven on summer squash, and one was found in Thomaston on cultivated cucumber. The wild cucumber, *Sicyos angulatus*, is recorded as being its favorite host plant. One pair of this species was caged, but no eggs were obtained, although potted summer squash, cultivated cucumber, and wild cucumber were supplied for food. Little information was found in the literature regarding the life history of this species, but it is probably very similar to that of the other two species.

References

Chittenden, F. H. 1899. Some insects injurious to garden and orchard crops. U. S. D. A., Div. of Ent., Bul. 19 n.s. Washington.

Parshley, H. M. 1918. Three species of *Anasa* injurious in the North. Jour. Econ. Ent., 11: 471–472.

CONTROL OF THE STRIPED CUCUMBER BEETLE

R. L. Beard

The striped cucumber beetle, *Diabrotica vittata* Fabr., is the most serious of those pests which attack squash and related cucurbits. Not only do the beetles attack the plants in spring and early summer in great numbers, but their larvae feed on the roots later in the season and transmit the bacterium, *Bacillus tracheiphilus*, which causes wilt disease.

As soon as the plants are out of the ground, they are susceptible to attack, and control measures at this time are important. A large number of treatments are commonly employed by growers of squash, but the efficacy of many of them is open to question. Certainly some dusts that are frequently used act merely as repellents and in no way reduce the beetle population.

In order to get some estimate of the value of certain insecticides, cage experiments were made in the summer of 1936. Potted squash plants were used for food material, and were covered by copper wire screen cages. Beetles were introduced into the cages, and the insecticides were applied through the wire screen. Five insecticides were tried, as follows:

Derris dust: containing 0.6 percent rotenone. (Derris root diluted with clay)
Derris spray: ground derris root used at a dilution of 1:200 with SS-3 spreader at a dilution of 1:1000.
Rotenone spray: a commercial product of cubé root, containing 2.5 percent rotenone, used at a dilution of 1:200.
Calcium arsenate: 1 part diluted with 9 parts of gypsum.
Pyrethrum dust: a concentrated pyrethrum dust containing 2 percent pyrethrins diluted with talc 1:9.

Beetles were also caged over untreated plants to serve as a check. Twenty-four hours after the insecticides were applied, counts were made to determine the killing powers of the dusts and sprays. The results obtained are as follows:

Treatment	Number of tests	Number of beetles	Number killed	Percent killed
Derris dust	4	70	70	100.0
Derris spray	3	47	46	97.9
Commercial rotenone spray	3	58	39	67.2
Calcium arsenate	2	40	18	45.0
Pyrethrum dust	1	38	38	100.0
Check	4	87	1	1.1

In this experiment the contact poisons would very likely be effective when stomach poisons might require a longer period of time to kill the insects. On the other hand, insecticides that kill by contact alone would be effective in killing only those beetles that were touched by the spray or dust. To determine the value of each insecticide over a period of days, a further experiment was made. The same plants used in the above experi-

ment were kept for five days during which time no beetles were allowed to feed on them. Then new sets of beetles were introduced into the cages. Feeding was permitted for 48 hours, and then counts were made as before, with the results as follows:

Treatment	Number of tests	Number of beetles	Number killed	Percent killed
Derris dust	2	53	20	37.7
Derris spray	1	44	7	15.9
Commercial rotenone spray	1	39	2	5.1
Calcium arsenate	2	70	8	11.4
Pyrethrum dust	1	15	1	6.7
Check	2	49	10	20.4

From these tests it is evident that the derris dust is the most effective of all the treatments. The pyrethrum dust is fully as effective as a contact poison but has no value as a stomach poison. The derris, in having the additional advantage of acting as a stomach poison, is effective for a longer period of time. In this second experiment, the derris dust is the only application that caused more deaths than the natural mortality, although in this case the natural mortality as shown by the checks is probably abnormally high. The reason for this is not known.

In the field, five blocks of summer squash were treated with derris dust, derris spray, calcium arsenate, and the commercial rotenone spray, using the same concentrations as in the cage experiments. In all cases there was some repellent action, but only the plants treated with derris dust showed many dead beetles. In this instance, the action is very rapid. Immediately upon being struck by the dust, the beetles drop to the ground, perhaps crawl a foot or so, and then die.

In a block of Hubbard squash, one-half of the plants were treated with derris dust and one-half with cubé dust, also containing 0.6 percent rotenone. There was no perceptible difference between the two, as the killing action was immediate in both cases.

From these tests, it may be concluded that derris dust, containing 0.6 percent rotenone, is the most effective treatment against the striped cucumber beetle and is to be preferred to the calcium arsenate, which heretofore has been the standard recommendation of this Station.

OBSERVATIONS ON TERMITES AND TERMITE CONTROL

N. Turner, M. P. Zappe and J. F. Townsend

In 1936, 165 privately owned buildings were examined on request of the owners for the presence of termites. In each case there was evidence of some wood-destroying insects, or termites had been reported by representatives of termite control companies. The following summary gives the results of these examinations:

	No. of buildings
Termites or termite damage	116
No termites found	13
Powder-post beetles	18
Carpenter ants	6
House and lawn ants	5
Wood borers	2
Carpenter bee (*Xylocopa virginica*)	1
Crabro wasps	1
Dry rot	3
Total examined	165

In two cases in which termites had been reported by termite control companies, no termites were found. One of these was an infestation by powder-post beetles in a large beam. The damage was similar to termite damage in general appearance, but the characteristic excrement of termites was not found. In the other case, a swarm of winged lawn ants (*Lasius* sp.) had been identified as termites.

Survey of Termite Damage to Buildings

During the past year there was an opportunity to examine a large number of public buildings for the presence of termites and termite damage. None of them was known to be infested by termites before the inspection was made. In general, the buildings represented a random sample since they were located in 22 towns of 6 counties. All types of structures from farm sheds to large masonry and concrete buildings were available for examination. The buildings varied in age from 3 to almost 200 years.

In conducting the inspection, a flashlight was used to examine all basement walls and piers for the presence of termite shelter tubes. All wooden bearing posts, rough-finished basement window frames, and sills and joists were punched with a screw driver to disclose any termite damage. Woodwork in finished basement rooms, and finished wooden floors in basements were examined carefully for settlement and for the checking characteristic in severe termite damage. In doubtful cases, trim and flooring were tapped lightly to determine the condition of the wood by sound. All wooden porches were examined, especially where wood was in contact with the ground.

A summary of the results is as follows:

	Type of construction	
	Masonry-concrete floors	Wood floors or framework [1]
No. buildings examined	144	318
No. with termites present	24	102
Percent with termites present	16.6	32
No. seriously damaged by termites	0	12
Percent seriously damaged by termites	0	3.8

It is obviously impossible to make a general application of these percentages to all buildings in Connecticut. The number of those examined is much too small for such a use. These figures merely signify that 16.6 percent of 144 masonry and concrete buildings, and 32 percent of 318 buildings having some wooden framework, were infested by termites. Only 12, or 3.8 percent, of the latter group were damaged so seriously that immediate structural repairs were necessary. Ten of these 12 buildings were more than 50 years old.

The outstanding cause of the presence of termites in masonry and concrete buildings was the presence of wooden form boards in the ground. Most of these buildings were not more than 10 years old. Termites had been attracted to the buried form boards and when these were consumed had sought food in the building proper. This shows definitely that form boards and wood scraps must be removed before filling in order to prevent annoyance and damage from termites even in this type of building.

The masonry and concrete buildings in which termites were found were usually not damaged to any appreciable extent. As a rule the termites were feeding on wood in the soil and had constructed shelter tubes over the

[1] Includes masonry with wooden floors, masonry or stuccoed veneer structures and wood-framed buildings.

foundation in seeking food. In many cases wooden basement window and door frames were infested. In two cases wooden basement floors laid over concrete were damaged, and in one instance records stored in a fireproof basement vault were badly eaten. On account of the type of construction termites could cause no serious trouble to these buildings. It is possible and practicable to use metal or treated wooden window and door frames and eliminate this type of damage. Wooden basement floors laid over concrete are usually susceptible to termite attacks, and their protection is both difficult and expensive.

The outstanding cause of termite infestations in the wooden buildings was the use of untreated wood in direct contact with the ground. The old buildings in this group had very porous foundations, in many cases simply a dry stone wall, which allowed the termites an easy access to sills or joists above. In buildings of more modern construction, entry usually was made through wooden porches or on account of improperly constructed masonry porches and terraces.

Of the 102 infested wooden buildings, metal termite shields were considered necessary for complete and permanent protection in 29 cases. Several of these were of small value and such an expenditure was obviously out of the question. In these cases it was suggested that the buildings be kept structurally safe by the use of temporary shoring and that they be replaced by new buildings as soon as practicable. In 72 of the infested wooden buildings, structural changes accompanied by thorough soil treatments were suggested. These structural changes varied from replacement of wooden basement posts and window frames to reconstruction of porches and extensive excavations under buildings with construction of piers for support. In all such cases the termite damage was not serious, and it was believed that structural changes with thorough soil treatment might be effective.

Effectiveness of Metal Termite Shields

Metal termite shields have been installed in several heavily infested buildings in Connecticut. Many of these installations were reinspected during the past year to confirm the effectiveness of metal shields. The reinspections were made in four buildings approximately one year after installation of the shields. In no case was there any sign of re-entry of termites. In one or two instances shelter tubes had been constructed up to the shield.

One other case requires comment. This was a colonial dwelling approximately 175 years old. It had been vacant for several years and was remodeled during the summer of 1936. In September, 1936, an infestation of termites was discovered. Since the foundation was simply a stone wall without mortar and the infestation was heavy, a metal termite shield was installed. Within a week after installation, termites had crossed *down over* the shield in four places: (1) A large shelter tube was built down from the edge of the shield and made contact with a shelf on the foundation below; (2) a shelter tube was constructed down over the shield at a point where the shield was bent down to clear a water pipe; (3) a shelter tube was constructed down over the shield through a poorly crimped lock joint; (4) a shelter tube had been built over a flat metal plate inserted under a door frame. In three of these four instances the termites had crossed the shield because the installation was not according to specifications. When these three places were repaired the termites could not cross the shield.

In the first case, "(1)", the tube was broken off and was not rebuilt by the termites. The unusual activity of the termites in building tubes down over the shield was due to the fact that the framework of the house was very damp. During the years the building was not occupied, leaks had developed in the roof and side walls. Since then the shield has been made perfect, a furnace fire started, and there has been no sign of termite activity above the shield.

This case simply emphasizes the necessity for careful work in shield installation. In spite of the heavy termite infestation, the termites have to date made no effort to cross *up over* the shield.

Observations on Soil Treatments

On August 17, 1935, a test soil treatment was made around a porch infested by termites. This was a wood-framed porch built on masonry piers. The porch floor was about 24 inches above the ground. The wooden steps were supported by chestnut posts set about 18 inches in the ground. The wooden lattices had been removed prior to treatment and were not replaced.

Shallow trenches were dug around the two piers and a few small holes were made around the two wooden posts supporting the porch steps. Phinotas oil was diluted at the rate of 1 part in 99 parts of water, and 35 gallons of the diluted solution were used in the treatment. The trenches and holes were filled with the treating solution, which was allowed to sink into the soil. This was repeated several times until the soil was saturated.

In June, 1936, termites were active in the posts. There were also living termites in the treated areas around the porch piers. In spite of the small area requiring treatment, the work was not successful.

On April 8, 1936, a test soil treatment was made in a dwelling. This building was of wood-frame construction on a poured concrete foundation. The termite infestation came from a large stump in an unfinished basement under an addition to the original building. When the trenches were dug for the additional foundation, the dirt was thrown against the sheathing of the original building. This allowed the termites direct access to the wooden framework.

The soil in the unfinished basement, which was about 15 by 20 feet in size, was treated with a 2.5 percent solution of Phinotas oil in water as follows: The soil was first removed from the sheathing, and then shallow trenches were dug around the foundation. In these trenches small holes were made with a crowbar at frequent intervals. Additional holes were made around the stump and at intervals of about two feet over the entire dirt floor. All these trenches and holes were flooded with the Phinotas oil solution. In addition, the stump itself was flooded with the solution. In all, 190 gallons were used. After treatment, test stakes of unpainted white pine were driven into the untreated areas. On June 18 the stakes were examined and no termites found. There were many dead termites in the stump but no living ones were seen and there was no additional damage to the framework. Late in December living termites were found in the stump.

In two instances there was an opportunity to recheck on commercial soil treatments in which Phinotas oil was used. In one case the material was applied in trenches, 2,500 gallons being used around a house in about 250 feet of trench. In several places termites were feeding on test stakes set in the treated soil within 60 days after treatment. Apparently the soil which was placed in the trench after treatment was not saturated. In the

other case, an infested building was treated by pumping Phinotas oil solution into holes made around the foundation. The treatment failed to stop the termite damage, probably because of poor penetration of the soil.

These observations show that this soil treatment is not at all satisfactory unless it is thoroughly done. It was apparent that in three of the four cases cited the treatment was not effective, and that in one case at least termites re-entered the treated soil within a few months. In the one apparently successful case a large amount of treating solution was used within a small area. Moreover, the foundations were of poured concrete, and all chance for entry except through shelter tubes was cut off.

PRESENT STATUS OF MOSQUITO CONTROL WORK IN CONNECTICUT

R. C. Botsford

A total area of 11,500 acres of salt marsh in the towns of Stamford, Norwalk, Westport, Fairfield, West Haven, New Haven, Hamden, East Haven, Branford, Guilford, Madison, Clinton, Westbrook, Old Lyme, Groton, and Stonington have been ditched in previous years for mosquito elimination with funds raised locally, and these ditching systems have been accepted by the Station for maintenance, according to statute. Since November, 1933, at which time the mosquito control project under the CWA was developed, about 9,000 additional acres of salt marsh have been ditched. The work was supported by federal funds, together with certain aid from the towns mostly in the form of tools, materials, equipment and transportation of the labor. These additional acres of ditched salt marsh cannot be maintained by the Station under the mosquito act until the Legislature supplies adequate funds for this purpose. Meanwhile upkeep of the drainage systems is left entirely in local hands. It is therefore recommended that these towns maintain the work at their own expense until state funds become available, and so prevent the total loss of the improvements which cost them so little.

Ditching systems installed in the salt marshes of the following towns have not been accepted for maintenance: Greenwich, Darien, Bridgeport, Stratford, Milford, North Haven, part of Clinton, Old Saybrook, Essex, East Lyme, Waterford, and New London. Ditching systems in fresh water areas will probably never be accepted for state maintenance under the present program. This type of improvement is more properly classified as storm drainage work, is distinctly a local problem, and should be maintained by local interests. When once the swamps and low areas are provided with an outlet and all of the natural waterways are properly graded, the mosquito problem will be eliminated.

Maintenance work on the accepted areas was carried on by the regular crews from April to November. After November 1, work was continued by C. F. Johnson, A. Lindquist and L. H. Bracken. Because of mild weather, it was possible to clean up many areas which had to be passed over during the rush of work in the mosquito breeding season. The work involved in regular maintenance consists of patrolling the areas, cleaning clogged ditches, correcting or repairing outlets, and eliminating any recently formed mosquito breeding areas. All of the above duties were carried on as thoroughly as possible with the small funds available. Nearly all of the

accepted areas were patrolled and damaged ditches corrected, but this work could be done only where danger of mosquito emergence was the primary consideration. The usual run of difficulties was encountered, as has been noted in previous reports, and it seems unnecessary now to repeat them.

The survey of mosquito breeding places was continued throughout the season by C. E. Jennings. Mosquito larvae were collected periodically from areas selected in various towns. About 1,600 specimens were reared for future identification. Many complaints of mosquito nuisances have been received, and in a majority of cases the area was visited and advice given for the elimination of the trouble.

The emergence of mosquitoes this season from maintained salt marsh areas was negligible. Fresh water mosquitoes were more abundant than usual.

The mosquito control project sponsored by this Station was transferred January 4, 1936, from the ERA to the WPA and was continued with an average of 600 men. The following brief resumé of this work deals chiefly with jobs listed as "not completed" in last year's report:

Ansonia: The jobs in this town, listed in last year's report (Bul. 383), known as Upper Colony Street, Hotchkiss Pond, Hull Street, and Cook's Pond, seem to function perfectly and entirely eliminate the mosquito breeding places which formerly existed.

The Westfield Avenue work was finished this season. The open ditch extending from Westfield Avenue to Jackson Street is completely walled up.

The Nelson Estate drain has been completed and is operating satisfactorily.

This completes all the project work planned for the Town of Ansonia.

Branford: The tide gates installed at Harbor Street and Sybil Creek are satisfactory. Water is leaking through the fill at the Sybil Creek gate, and this should be repaired.

The Branford River tide gates, although operating well, need attention due to a leak under the sill.

The work at Stony Creek dike, which was suspended for some time, has been continued.

No work has been done in the Bullard Swamp nor on the proposed tide gate for the East Branch of the East Haven River.

Clinton: The new tide gate installed on the Hammock River has dried up the swampy places at the rear of Grove Beach.

More work is to be done on the Hammonasset River and in the salt marsh near Grove Beach north of U. S. Highway No. 1.

Darien: This work was suspended indefinitely.

Derby: The work done at Coon Hollow, Pickett's Pond Brook, Island Park Pond, and Cedric Avenue has resulted in eliminating all of the mosquito breeding places in those areas.

Work in the Derby Meadows, after being suspended for some time, has been reopened and the ditches regraded. It is proposed to extend the 48-inch pipe near the carbarns north to the arch bridge.

East Hartford: About all of the work in the Connecticut River bottom land was completed last year. The severe flood of last spring did very little damage to this work, and after slight repairs the mosquito breeding areas remained dry throughout the season.

A new culvert was installed at Pitkin Street, which lowered the water in the swampy area.

Work is continuing in the swampy areas which drain into the Hockanum River and Willow Brook.

East Haven: In response to a petition from citizens, a swampy area east of High Street was ditched.

After the railroad company repaired its culvert at Tuttle Brook, the ditched area was completely overhauled.

The Bradford Cove drainage area was completely ditched and the work extended into the fresh water swamps.

The Caroline Creek and the Farm River work has not yet been started.

East Lyme: The engineers have devised a plan for improving the outlet of Bride's Brook at Rocky Neck Park. The work has not yet been started.

Nothing has been done at Crescent Beach.

Essex: All of the work planned for the town of Essex has been completed.

Fairfield: The Ash Creek Pond has been drained and receives the tidal action.

The new 48-inch pipe with manhole and tide gate has been installed at the outlet of Honey Pot Creek, and after the culvert under the new Post Road is lowered, it will be possible to straighten and deepen the main channel and reditch the area.

At Fairfield Beach the broken tile has been removed and replaced with new tile. The tide gate and manhole will be rebuilt and cast iron pipe installed for the outlet.

Greenwich: All projects at Greenwich have been completed and further work discontinued.

Groton: Work planned in Groton was completed and further work suspended until labor becomes available.

Guilford: At Great Harbor it will be necessary to build a jetty from the tide gate across the beach.

Work at Indian Cove Marsh has been suspended and reopened from time to time, but work is now proceeding on the manhole and tide gate.

Hamden: There is no project for mosquito control work in the town of Hamden.

Madison: There has been no assignment of labor in Madison.

Manchester: Work was continued on the Boggy Stowe outlet. Sixteen hundred feet of 24-inch pipe and six manholes have been constructed.

Milford: The work at Beaver Brook has been suspended, but something must be done to correct the condition under the bridge at Naugatuck Avenue.

At Point Beach the tide gate and manhole has been constructed and much of the concrete pipe has been laid.

All drainage work completed last year has operated satisfactorily.

New Haven: The Morris Creek area has been reditched and is in good condition. It will be necessary to rebuild the abutments of the tide gate.

North Haven: Work here consists of draining fresh water swamps bordering the salt marsh area.

Norwalk: The tide gate and manhole at Wilson Point is completed and the work will continue up through the main ditch.

Old Saybrook: The Oyster River tide gate has been completed and will lower the water in the large swampy area.

Shelton: The work of stoning up the sides of the Burying Ground Brook is completed and all labor withdrawn from the project in Shelton.

Southington: The Quinnipiac River is running in the new channel, the sides of which have been stoned up or graded and sodded. The depressions left by the old river bed will be graded.

Stamford: All work in Stamford was completed and the labor withdrawn.

Stratford: The repair work on the Great Meadow dike was discontinued last fall and will be suspended until March.

The work at Surf Avenue, Sniffen's Meadow, and the F. C. Beach Marsh was undertaken and tide gates with manholes have been constructed to protect these low areas.

Waterford: The work in Waterford was suspended because of no labor assignment.

West Haven: The work at Oyster River was suspended last season, but more work should be done there.

The main ditch at Cove River has been completed back to the fresh water area. Nothing yet has been done about rebuilding the tide gate.

Westport: But little was accomplished in Westport last season. Work will be resumed soon at the ditch near the Minute Man's statue. The work will include building a manhole and tide gate, and regrading the full length of the ditch.

MISCELLANEOUS INSECT NOTES

Outbreak of Say's Blister Beetle. Say's blister beetle, *Pomphopoea sayi* Lec., was very abundant in a certain locality in Sharon, visited by Mr. Zappe on June 11. The beetles ate the foliage and blossoms of the lupine plants in gardens and one owner gathered a water pail half full of them. [W. E. Britton.]

The Greenhouse Leaf Tier. The greenhouse leaf tier, *Phlyctaenia rubigalis* Guen., was very abundant in a greenhouse in New Britain and caused considerable damage to a variety of plants. The greenhouse was examined on June 4. Many adults were present, attracted to the lights. The owner planned to capture them by using moth traps. [M. P. Zappe.]

A Leaf Roller on Hickory. Mr. Philip Wallace observed leaf roller infestations of shagbark hickory in Durham, May 21, where six small trees from 10 to 12 feet in height had 60 percent of their leaves rolled and each roll contained a larva. Two weeks later he observed that the insect was present in Plainville, and very abundant in New Britain. This is probably the hickory leaf roller, *Eulia juglandana* Fern. [W. E. Britton.]

Elms Injured by Rose Chafer. Mr. Philip Wallace reported that in some sections of Colchester the rose chafer, *Macrodactylus subspinosus* Fabr., in large numbers fed upon elm trees. On June 16, the damage appeared much like that caused by full grown canker worms, and the trees were brown. The rose chafer was not generally abundant throughout the State in 1936, although many beetles were caught in Japanese beetle traps in Norfolk and Winsted. [W. E. Britton.]

Scarcity of the Fall Webworm. The fall webworm, *Hyphantria cunea* Drury, was conspicuous by its absence or scarcity in Connecticut in 1936. Never has it been so scarce since the office of State Entomologist was established in 1901. Usually the nests are very plentiful on all kinds of trees in late summer, particularly along the roadsides. In 1936, one could drive from one end of the State to the other and see only two or three nests. [W. E. Britton.]

The Pepper Maggot in Connecticut. On July 11, Doctor Garman of this department discovered some adults of the pepper maggot, *Zonosemata* (*Spilographa*) *electa* Say, on pepper plants in his garden in Hamden. This insect has been destructive to peppers in New Jersey for the past 14 years. Although reported from the State this is the first definite Connecticut record of the species in the Station collection. The adult is a two-winged fly belonging to the Family Trypetidae, with yellowish body and wings with dark brown transverse bars. [W. E. Britton.]

Damage by the Poplar Sawfly. Mr. Schread of this department reported that practically all of the Carolina poplar trees in Bridgeport were infested, in August, by the poplar sawfly, *Trichiocampus viminalis* Fall. Some trees were entirely defoliated and others only partially defoliated. Many trees had lost much of their foliage earlier in the season through the ravages of satin moth caterpillars. The sawfly larvae are about three-fourths of an inch in length, bright yellow, with two rows of dorsal black spots as shown in Figure 62. There is a lateral row of smaller black spots near the spiracles. The head is black and there is a black spot on the posterior extremity. Spraying the trees with lead arsenate will protect the foliage.

[W. E. Britton.]

FIGURE 62. Larvæ of poplar sawfly, *Trichiocampus viminalis*, on poplar leaves. Natural size.

Peach Foliage Eaten by a Flea Beetle. A small, bright, metallic green flea beetle, *Chalcoides* (*Crepidodera*) *helxines* Linn., sometimes called the willow flea beetle, perforated the leaves in a peach orchard in Southington in May, causing some damage. Mr. Zappe visited this orchard and reports that the adjacent chokecherry hedges were heavily infested by beetles, more so than the peach trees, and in his opinion they had invaded the peach orchard from the chokecherry bushes. The injury was hardly sufficient to warrant spraying, but possibly the best remedy would be to apply lead arsenate to the infested chokecherry bushes. This flea is a somewhat general feeder, is common on poplar and willow, and occasionally injures fruit trees.

[W. E. Britton.]

Peach Trees Injured by New York Weevil. In one orchard in Cheshire, peach twigs were damaged in May by the New York weevil, *Ithycerus noveboracensis* Forst. The adult beetles gnawed into the bases of the new shoots,

eating the bark usually on one side but partially girdling them. Fruit trees of all kinds are occasionally injured, and some trees seriously damaged, although the insect breeds in the twigs of hickory, oak, and probably other woodland trees. This is one of the larger species of weevils or snout beetles, and is about five-eighths of an inch in length, ash-gray in color, with longitudinal whitish bars interrupted by black spots on the thorax and wing covers, as shown in Figure 63. The usual control measures recommended are hand picking, or jarring the trees, and catching the weevils on sheets spread upon the ground under the trees. [W. E. Britton.]

FIGURE 63. New York weevil, *Ithycerus noveboracensis*. Adults, twice natural size.

The Elm Leaf Beetle. The elm leaf beetle, *Galerucella xanthomelaena* Schr., was perhaps less destructive in Connecticut in 1936 than for several years, but its ravages were evident in certain localities, and I am indebted to Mr. Wallace for most of the notes given here. This insect was more prevalent in the Housatonic and Naugatuck River valleys as far north as Waterbury than observed elsewhere. Brown foliage was noticed in the towns of Stratford, Milford, Shelton, Derby and Ansonia, but there was distinctly less injury noticed as one ascended the elevations east and west from the Naugatuck River. At Norwalk the infestation was reported heavy in spots of lower altitude and negligible over the surrounding hills. There were spotted infestations in Barkhamsted, Torrington, Meriden, North Haven, and Berlin, but no serious damage. There was no noticeable damage between New Milford and Cornwall Bridge, or around Norwich and Ledyard. [W. E. Britton.]

Prevalence of the Forest Tent Caterpillar. The forest tent caterpillar, *Malacosoma disstria* Hubn., was more prevalent in Connecticut in 1936 than for many years. The writer found a few caterpillars on the trunks of paper birch trees in his own yard in New Haven in May. On June 4, he visited CCC Camp Britton at Windsor, and on the trunks of young oak trees in and near the camp there were many caterpillars resting, from 2 to 30 on each tree. Some of the leaves showed feeding, but there was no de-

foliation. Mr. Zappe observed the caterpillars on linden and maple at Litchfield and Thompsonville, June 8, and at Sharon and Salisbury on June 16, but the injury was not serious. According to reports, large areas of woodland in New Hampshire, Vermont, northern New York and Canada were stripped in 1936. The appearance of the caterpillars is shown in Figure 64. Shade trees may be protected by spraying with lead arsenate as recommended for canker worms. [W. E. Britton.]

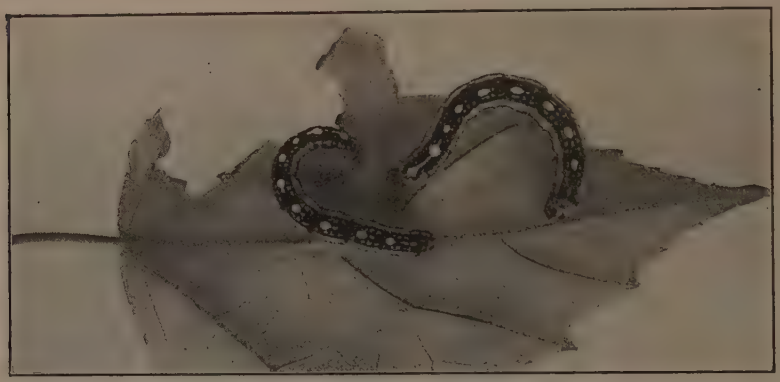

FIGURE 64. Forest tent caterpillar, *Malacosoma disstria*. Larvae, on maple leaf. Natural size.

A New Mite on Box. In 1932, Mr. Donald T. Ries, of Cornell University, discovered a mite on box plants in Oakland and Wayne counties, Michigan, where the plants were heavily infested. Mr. Ries hunted for this pest in other sections of Michigan and in neighboring states where box plants are grown, but did not find it. In seeking to obtain an identification of the species, about two years ago he corresponded with Doctor Garman and sent him specimens. As this mite seemed to be a new species, Doctor Garman prepared a description with drawings of structural characters. This description, together with Mr. Ries' notes on life history, habits and control, was published in the Journal of Economic Entomology, Vol. 28, page 55, February, 1935. The name is *Neotetranychus buxi* Garman, and this mite is now present in Connecticut, as specimens on box foliage were received from Old Lyme, July 7 and September 21, and from Saugatuck, August 29. [W. E. Britton.]

Alders Stripped by a Sawfly. On September 10, Mr. Wallace brought to the Station from East Hampton, several sawfly larvae from smooth or tag alder, *Alnus rugosa*, the bushes of which had been stripped. Mr. Wallace had noticed a similar defoliation of alders in Prospect, August 25. He visited the place again on September 5, and could find no larvae on the bushes or any larvae or pupae in the soil. Dr. E. A. Back of the Bureau of Entomology and Plant Quarantine, Washington, D. C., who owns a summer home at Chaplin, Conn., reported in Insect Pest Survey Bulletin, Vol. 16, page 416, November, 1936, that he observed defoliated alders in a swamp near Middletown, September 4. The alders had been stripped earlier in the season and were still bare. Cast larval skins were attached to the

twigs and leaf petioles. Adults were emerging in large numbers from the soil, and proved to be *Hemichroa americana* Prov. This is probably the same species responsible for the defoliation observed by Mr. Wallace.

[W. E. Britton.]

Damage by a New Blister Beetle. In June, 1934, a blister beetle was received from a correspondent on an unidentified semitropical tree in Darien. It exactly fitted the description of *Macrobasis torsa* Lec., a species described from Texas, and not previously known to occur in Connecticut. On June 19, 1936, four beetles were received for identification from Ridgefield, without indicating the food plant. In response to a call, an infesta-

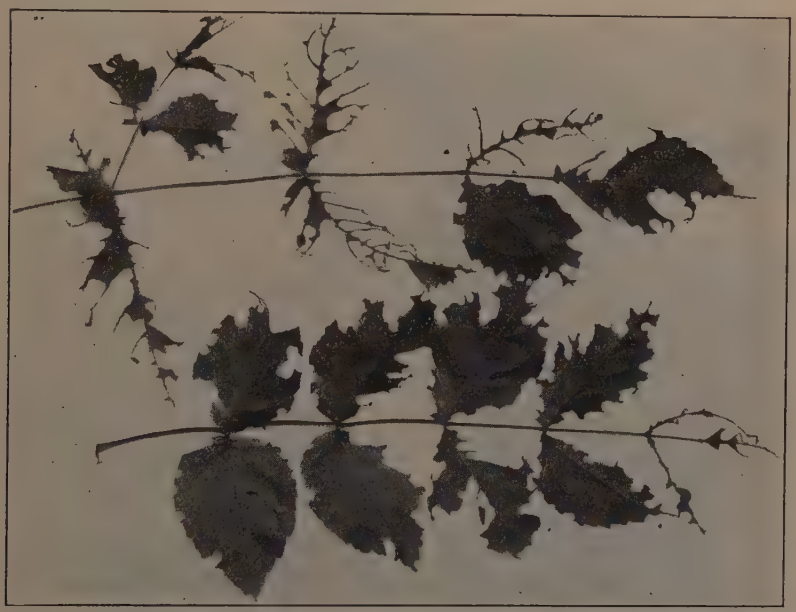

FIGURE 65. Leaves of Hercules club, *Aralia spinosa*. eaten by a blister beetle, *Macrobasis torsa*. Much reduced.

tion in Derby was visited June 3. The place was on the east shore of the Housatonic River, and the beetles were very numerous and feeding upon hercules club, *Aralia spinosa*, several specimens of which were completely defoliated. Injured leaves are shown in Figure 65. Feeding began near the ground and gradually progressed upward, finally defoliating the entire trees. Adults were exceedingly active and would fly away when disturbed. Heretofore this plant has not been injured by insects in Connecticut. Leng's List of Coleoptera records this beetle from Texas and Massachusetts.

[M. P. Zappe.]

Strawberries Injured by *Diplotaxis atlantis*. On May 11, a strawberry grower of Foxon in East Haven brought to the office several adults of the beetle *Diplotaxis atlantis* Fall, which were reported as abundant and feeding on the foliage of newly-set strawberry plants. The place was visited

on May 13. Injured leaves were observed over the one and one-half acre field, but most of the damage was on several rows at the east side where from one-third to one-half of the foliage on many of the plants had been eaten, as shown in Figure 66, and a few were completely defoliated. The beetles fed at night and hid during the day in the loose soil near the base of the plants at a depth of about two inches. The owner found 17 beetles around one plant and with the aid of a flashlight had collected several quarts of beetles from the plants at night. Two older fields of strawberries,

FIGURE 66. Strawberry plant injured by the Scarabaeid beetle, *Diplotaxis atlantis*. Adult beetle is shown at lower right. Natural size.

nearer to brush land where the beetles are naturally supposed to occur, showed no injury. It was suggested that the owner spray the plants with lead arsenate and continue the hand picking. [B. H. Walden.]

House Timbers Injured by Anobiid Beetles. On July 2, a house in Collinsville was examined for damage by powder-post beetles. This building was a small dwelling and the framework and floors were built of native

lumber. Examination showed serious damage to the joists and first floor. In some cases the joists were badly weakened by the beetles. The surface of the wood showed many exit-holes of the emerging beetles. These were a little more than a sixteenth of an inch in diameter. Samples of the wood were brought into the laboratory and mature beetles, larvae and pupae removed. M. P. Zappe determined the beetles as *Anobium punctatum* DeGeer (*striatum* Oliv.). In Europe this insect is known as the furniture beetle, and it causes serious damage to furniture and structural timbers. It also breeds on dead branches of trees. Apparently it is not very common in this country, and this was the first time it had been reported from Connecticut. Larvae can be killed and further infestation prevented by painting the affected lumber with one of the following materials: (1) A creosote shingle stain, (2) a solution of one pound paradichlorobenzene in one gallon of kerosene, or (3) a proprietary pine oil preparation.

[Neely Turner.]

The Lime-Tree Looper. The lime-tree looper, *Erannis tiliaria* Harr., was abundant on linden trees in Durham, May 21, and in Guilford, July 4, and caused considerable injury according to Mr. Wallace. He also found

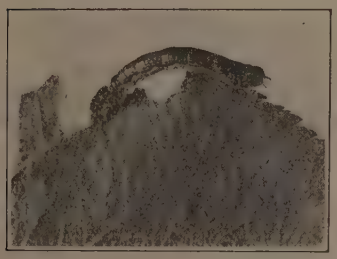

FIGURE 67. Larva of lime-tree looper. Natural size.

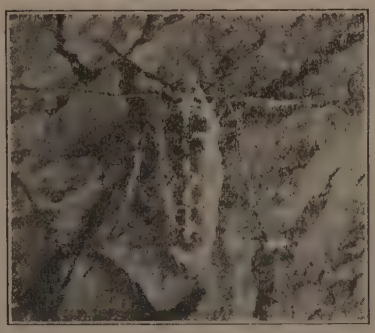

FIGURE 68. Adult female of lime-tree looper. Twice natural size.

this insect feeding on elm in New Britain, May 25. The insect seemed to be rather prevalent generally, as Mr. Zappe observed the caterpillars feeding with spring canker worms on elm at Litchfield, Salisbury and Sharon, and on maples at Litchfield and Thompsonville with the forest tent caterpillar. Two caterpillars on linden were received May 23, and one on elm, from Watertown, June 1. The mature caterpillar is about one and one-half inches in length, bright yellow, with rust-brown head, and 10 crinkled black lines extending lengthwise along the back. There is wide color variation and some caterpillars appear almost black dorsally, and others are distinctly light-colored. The female is wingless, greenish-yellow, with two rows of black spots on the back, and half an inch in length. The caterpillar is shown in Figure 67, and the female in Figure 68. The male has buff wings marked transversely with two wavy brown bands, and a wing spread of about one and three-fourths inches. Spraying with lead arsenate will protect the foliage from injury. [W. E. Britton.]

Prevalence of the Psychid Moth, *Fumea casta.* A small Psychid moth has been observed in New Haven for more than 20 years. Each larva lives in a case covered with bits of sticks, leaf and *debris*, and these cases are found attached to the walls of houses, porch railings and fences, particularly when banked with shrubbery. This insect was listed in the Check-List of the Insects of Connecticut (Bul. 31, State Geol. and Nat. Hist. Survey, p. 114), and in the reports of this Station for 1933 (Bul. 360, p. 398) and 1935 (Bul. 383, p. 259) as *Eurycyttarus confederata* Gr. and Rob. Recent studies by Mr. Donald W. Farquhar in eastern Massachusetts, prove this moth to be the European species, *Fumea casta* Pallas (Psyche, Vol. XLI, p. 19, March, 1934). *E. confederata* is a larger species with broader and blacker fore-wings, and possibly may not occur in Connecticut. The larvae of *casta* are said to feed upon grasses, mosses, lichens and the like, but occasionally they are predaceous upon other small insects. In 1935, specimens were received from New Haven, June 15, 18; Hamden, June 24; Branford, June 28. In 1936, winter cases were received from West Hartford, May 20, and several lots of material were gathered in New Haven for the Station collection. [W. E. Britton.]

The Fall Canker Worm. In 1936, the fall canker worm, *Alsophila pometaria* Harr., probably was less destructive than in 1935 or perhaps for the three seasons preceding 1936. It was present on the Station grounds in New Haven, and the shade trees were protected by spraying. A few trees were observed in New Haven, Orange and Woodbridge, that had been partially defoliated, and this insect was fairly common in southern and southwestern Connecticut. Mr. Wallace reported considerable damage to elms by canker worms at New London, June 16; little or no canker worm infestation of elms at Norwich and Ledyard. Canker worms were not abundant this season in Berlin, Hartford, Meriden, New Britain, North Haven, Wallingford, and West Hartford. Egg-masses were abundant in March in some apple orchards in New Haven County, and many young caterpillars were killed by the pink spray. On November 21, 1935, Mr. Zappe examined an area in Wilton where the mountain laurel had been defoliated. He considered this defoliation to be the work of canker worms, which were very abundant in the locality and nearly all the oaks and birches had been stripped by them. Specimens of the fall canker worm were received as follows: Adult females, Ridgebury, November 30; adult males, Branford, December 9, 1935; larvae and injured leaves, Norwalk, May 22; on linden, May 23, Litchfield, June 1; on elm, Watertown, June 1; injured maple leaves, Cannondale, June 10. Spraying with lead arsenate about May 15 will protect the foliage. [W. E. Britton.]

Bird Mites in a Dwelling House. On June 27, 1936, a resident of Westport visited the Station and consulted with Doctor Britton regarding a mite infesting his house. This insect crawled over the woodwork and beds and caused great annoyance to the occupants. The mites were apparently quite numerous and had caused a kind of eczema about the neck and arms of those persons using the rooms at the time. Doctor Britton recommended fumigation with naphthalene flakes, and spraying the trees and house outside with lime sulfur, which was done by the owner. Some of the trees nearest the house were also removed. Microscopic examination showed the species of mite to belong to the genus *Liponyssus*[1] or bird mites. This

[1] This was identified as *L. sylviarum* C. and F. commonly reported from small birds and chickens, and known as the feather mite.

was reported to occupants of the house, and on examination they found a vacant phoebe's[2] nest directly above a window of one of the infested rooms. Careful examination of the premises revealed no other source of infestation, but examination of the bird's nest, which had been saved, showed a large number of the mites still alive, together with countless cast skins indicating a very large and concentrated mite population at one time. It is believed that this nest was the chief, if not the only, source of trouble, since no further complaint was received after its removal. Doctor Stanley C. Ball of the Yale Peabody Museum reports having had similar experiences in regard to mites from birds' nests reported from New Haven and vicinity. Shortly after the Westport investigation, specimens of the

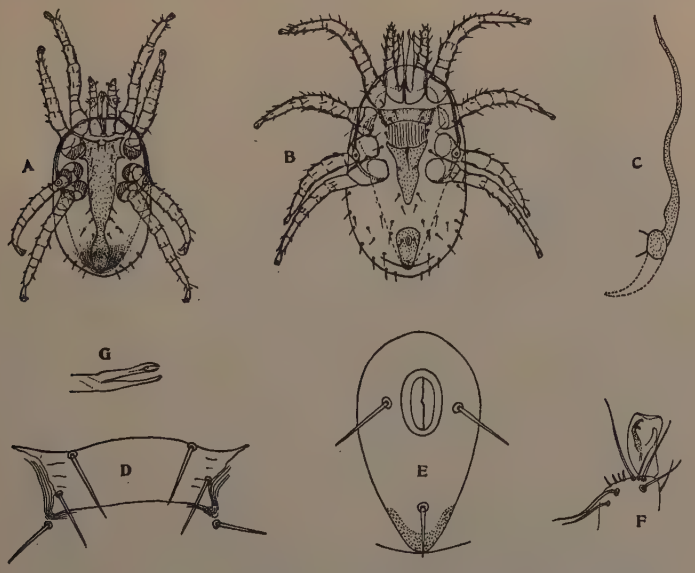

FIGURE 69. Bird mite, *Liponyssus sylviarum*. A, adult male, ventral view; B, adult female, ventral view; C, right peritreme of female; D, sternal plate of female; E, anal plate of female; F, tarsal claw, leg I, female; G, female, chelicera. All greatly enlarged.

same mite were received from Mr. B. G. Pratt, of LaMotte, Vermont, who reported that they were causing considerable inconvenience and annoyance and were presumably coming from birds' nests on the premises The naphthalene flake fumigation carried out the same as for fleas was apparently effective in killing large numbers of mites since numerous dead ones were found in the rooms so treated. (See Figure 69.) [Philip Garman.]

Damage by the Spring Canker Worm. The spring canker worm, *Paleacrita vernata* Peck, was more prevalent in Connecticut in 1936 than I have ever seen it since coming to the State in 1894. In southern Connecticut, small numbers of spring canker worms are commonly seen feeding with fall canker worms, but the fall canker worm, *Alsophila pometaria* Harr., is far more abundant and is chiefly responsible for canker worm damage

[2] *Sayornis phoebe.*

near the coast. In 1936, the spring canker worm was prevalent throughout the northern and northwestern portions of Connecticut and caused severe defoliation in several cases. In Lakeville, according to Mr. Zappe, about 200 elm trees were entirely defoliated June 11 and many others in Lakeville and Salisbury partially defoliated. In Sharon about one-third of the foliage of the elm trees had been eaten when the trees were sprayed and the remaining foliage protected. Mr. Wallace reports that along the highway from Cornwall Bridge to Canaan there were several localities where from 2 to 50 large elms were completely defoliated on May 27. Mr. Zappe observed spring canker worms on elm trees at Litchfield and on oaks at

FIGURE 70. Large elm tree, Simsbury, defoliated by the spring canker worm. Photographed June 4, 1936.

Prospect, June 8. Mr. Johnson collected them from elm along the highway between Waterbury and Thomaston, June 1. On June 4, in company with Mr. Filley, I examined some elm trees near the highway in Simsbury, at the junction of the Tariffville road, where several large elm trees and apple and oak trees had been completely defoliated as shown in Figure 70. Many other trees of the same kinds had been partially defoliated. Specimens of this insect were received as follows: Adults, Bridgeport, March 16, Westport, March 25; larvae, on apple and elm, Danbury, May 25, on apple, Bridgeport, May 29, on elm, Watertown, June 1, Litchfield,

June 1. The foliage may be protected by spray applications about May 15, containing 5 pounds lead arsenate, 2 pounds caseinate of lime spreader and 100 gallons of water. [W. E. Britton.]

Decrease of the Tent Caterpillar. The tent caterpillar, *Malacosoma americana* Fabr., has been extremely prevalent in Connecticut for the past three seasons, and it is believed that the peak of abundance was reached in 1935. In 1936, this insect was still very abundant in certain sections of the State but much less so in others. Throughout New Haven County the nests were extremely prevalent, and showed no particular decrease from 1935. Mr. Wallace has traveled extensively about the State in connection with the elm sanitation project of the WPA, and I am indebted to

FIGURE 71. Peach orchard defoliated by tent caterpillars, at Foxon, 1936.

him for notes and observations, some of which are used here. There was a heavy infestation in Berlin and all cherry and apple trees were from 75 to 100 percent defoliated. The pest had spread to adjacent beech, birch, hickory, linden, maple and oak trees, with severe defoliation to American beech, black birch, red oak and white oak. The pest was also prominent in Canton, New Britain, Plainville and Southington. Gray birches along the roadsides in Wallingford were nearly defoliated May 14. There were localities in every county in the State where tent caterpillar ravages were conspicuous. Outside of New Haven and Hartford counties, already mentioned, severe defoliation occurred in Litchfield, Torrington, Winsted and Woodbury, but in general in Litchfield County and the entire northern tier of towns across the State, the nests were less conspicuous than in 1935. In Norwich, Ledyard and North Stonington the nests were comparatively scarce. In many localities caterpillars died from the wilt

disease, and, of course, many died from starvation. Egg-clusters at New Haven began to hatch April 4. Doctor Garman made some observations on the effect of sprays on the hatching of the eggs, described on page 379. Figure 71 shows the appearance of a young peach orchard in Foxon, defoliated by the caterpillars and photographed May 13. Undoubtedly this insect will be less prevalent in 1937 and also in the three or four succeeding years. [W. E. Britton.]

A New Weevil Injuring Pine in Connecticut. The presence of this insect in Connecticut was first noted on May 5, 1936, when a number of Scotch pine trees were found to be in a dying condition in Old Lyme. Examination showed that the trees were partially or entirely girdled at the root crown. Several larvae about 15 mm. long were found burrowing in

FIGURE 72. Base of Scotch pine injured by the new weevil, *Hylobius radicis*. Much reduced.

the base of the trunk between the ground level and the root system. The larvae were identified as those of *Hylobius radicis* Buch., a species recently described. Their work is very similar to that of the common *pales* weevil, but there is some difference in the life history as well as in structure. The adults probably emerge from hibernation in the spring and lay their eggs in the soil close to the base of the tree. The larvae enter the trunk and construct galleries in the bark, eventually girdling the tree. The tun-

neling causes an abnormal flow of pitch from the base of the trunk. As the tissues are destroyed, little remains of the outer surface of the trunk but a mass of pitch mingled with frass and covered with bits of broken bark. (See Figure 72.) The larvae spend the following winter in the galleries, and continue to feed until late spring, when they leave the tree and pupate in the surrounding soil. The adults emerge during the latter part of the summer and go into hibernation in late fall. This weevil apparently is distributed throughout the eastern part of the United States, as it has been recorded from New York and Minnesota. Subsequent to the first Connecticut record, specimens have been received from New London on June 10, and Sea Cliff, Long Island, August 28, 1936. Control recommendations for the *pales* weevil consist of the application of one-half to one ounce of powdered sodium cyanide per tree. These measures should prove effective in control of *H. radicis*, but reinfestation is not prevented by the use of this material.

Literature

Twenty-third Rpt. N. Y. S. Conservation Dept., Division of Lands and Forests, **103**. 1933.

Buchanan, L. L. An apparently new species of North American *Hylobius*, with synoptic key (Coleoptera: Curculionidae). Proc. Ent. Soc. Wash., 36: 252. 1934.

[G. H. Plumb.]

FINANCIAL STATEMENT

Insect Pest Appropriation

July 1, 1935 - June 30, 1936

RECEIPTS

Insect Pest Appropriation	$ 44,000.00	
Contributions from peach growers for peach moth parasite work	400.00	
Receipts from nurserymen (costs of inspection for failure to register before July 1)	25.00	
Miscellaneous Receipts (mileage for use of automobiles)	10.36	
Refund (automobile insurance)	39.11	
	$ 44,474.47	
Partial Salary Cut Restoration	1,071.61	
		$45,546.08

DISBURSEMENTS

Salaries	$ 29,457.50	
Labor	6,006.48	
Stationery and office supplies	340.04	
Scientific supplies (chemicals and laboratory supplies)	177.30	
Scientific supplies (spraying and dusting materials)	226.32	
Scientific supplies (photographic supplies)	72.13	
Miscellaneous supplies	257.57	
Automobile oil	52.31	
Telegraph and telephone	491.27	
Postage	227.50	
Travel (outlying investigations)	1,836.59	
Travel (meetings, conferences, etc.)	198.90	
Travel (gasoline for automobiles)	410.48	
Transportation of things (freight, express and parcel post)	14.59	
Transportation of things (other expenses)	5.25	
Publications (reprints, etc.)	123.25	
Gas and electricity	304.09	
Water	61.44	
Rent of truck for spraying	63.75	
Storage of apples	60.32	
Insurance (automobile)	147.68	
Miscellaneous contingent expenses	25.75	
Furniture, furnishings and fixtures (purchases)	200.14	
Furniture, furnishings and fixtures (repairs)	69.29	
Library (books and periodicals)	794.78	
Library (binding)	64.15	
Scientific equipment (purchases)	561.73	
Scientific equipment (repairs)	20.61	
Automobiles (purchases)	955.06	
Automobiles (repairs)	310.97	
Tools, machinery and appliances (purchases)	682.19	
Tools, machinery and appliances (repairs)	52.93	
Buildings (repairs and alterations)	43.86	
Total disbursements		$44,316.22
Balance on hand June 30, 1936		1,229.86*
		$45,546.08

* Reverts to State Treasury.

EXPENDITURES CLASSIFIED BY PROJECTS

(Approximate)

General	$ 26,976.12
Nursery Inspection	1,924.84
Japanese Beetle	4,149.50
European Corn Borer	3,215.45
Oriental Fruit Moth and Parasites	7,285.86
European Pine Shoot Moth	764.45
Total	$ 44,316.22

PUBLICATIONS, 1936

W. E. Britton

Connecticut State Entomologist. Thirty-Fifth Report. Bul. 383, 122 and vi pp., 29 figs., with index. April, 1936. (Issued June, 1936).

The Eastern Tent Caterpillar. Bul. 378, 22 pp., 23 figs. November, 1935. (Issued February, 1936).

Connecticut Laws Concerning Plant Pests, Diseases of Bees and Mosquito Elimination. Cir. 108, 8 pp. November, 1935. Issued (December, 1935).

Law and Regulations Concerning the Inspection and Shipment of Nursery Stock in Connecticut. Cir. 115, 8 pp. May, 1936.

Regulations Concerning the Transportation of Nursery Stock in the United States and Canada. Cir. 116, 26 pp. June, 1936.

Clusters of *Atherix variegata*, Walk., Mistaken for Rust Patches. Ent. News, XLVII, 55. February, 1936. (25 separates).

Book Review: Insect Enemies of Shade Trees, by Glenn W. Herrick. Jour. Econ. Ent., 29, p. 222. February, 1936.

Report of Committee on Injurious Insects. Proc. 45th Annual Meeting, Conn. Pomol. Soc., p. 180. April, 1936.

W. E. Britton and W. L. Slate

Control of the European Corn Borer. Clean-up Order for 1936. Special Bulletin, 1 p. (Issued April, 1936).

W. E. Britton and M. P. Zappe

Inspection of Nurseries, 1935. 10 pp. Reprinted from Bul. 383, pp. 269–278. June, 1936. (500 copies).

Philip Garman

Control of the European Red Mite and White Apple Leafhopper. Rpt. 42nd Annual Meeting, Mass. Fruit Growers Assoc., Inc., pp. 144–157. (Issued March, 1936).

Red Mite, Leafhopper and Leaf Roller. Proc. 45th Annual Meeting, Conn. Pomol. Soc., p. 237. April, 1936.

Notes on the Apple Maggot. Jour. Econ. Ent., 29, pp. 542–544. June, 1936.

Insect Control Problems. In Pomological Pointers for Connecticut Fruit Growers, No. 93. August, 1936.

Philip Garman and J. F. Townsend

Control of the White Apple Leafhopper. Cir. 111, 11 pp., 8 figs. March, 1936. (Issued April, 1936).

R. B. Friend

The European Pine Shoot Moth in Connecticut. In 65th Annual Rpt. Ent. Soc. Ontario for 1934, pp. 50–54. (Published, 1935, and received March, 1936).

The Eastern Spruce Gall Aphid. Tree Pest Leaflets, No. 1, Mass. Forest and Park Assoc., 4 pp., 2 figs. October, 1936. (500 separates).

The Birch Leaf Skeletonizer. Tree Pest Leaflets, No. 2, Mass. Forest and Park Assoc., 4 pp., 2 figs. October, 1936. (500 separates).

The European Pine Shoot Moth. Tree Pest Leaflets, No. 3, Mass. Forest and Park Assoc., 4 pp., 2 figs. October, 1936. (500 separates).

R. B. Friend and H. W. Hicock

The European Pine Shoot Moth. Proc. 11th Natl. Shade Tree Conference, pp. 90–95. (Issued December, 1935).

Notes on the European Pine Shoot Moth. Jour. Econ. Ent., **29**, p. 210. February, 1936.

Neely Turner

Book Review: Our Enemy the Termite, by Thos. E. Snyder. Jour. Econ. Ent., **29**, p. 223. February, 1936.

Insecticides to Control the European Corn Borer. Cir. **114**, 4 pp., 1 fig. June, 1936.

Termites: What They Are, the Damage They Do, and the Means of Prevention. The World Today (Encyclopaedia Brittanica) 4, 8, 2½ pp., 3 figs. September, 1936.

Potato Leafhopper on Dahlias. Florists' Review, **78**, No. 2024, p. 24. September 10, 1936.

Neely Turner and R. B. Friend

Control of the Mexican Bean Beetle in Connecticut. Cir. **109**, 8 pp. November, 1935. (Issued December, 1935).

Neely Turner and J. F. Townsend

Termite Control in Buildings in Connecticut. Bul. **382**, 38 pp., 16 figs. March, 1936. (Issued April, 1936).

Neely Turner and M. P. Zappe

Termite Damage in Connecticut. Jour. Econ. Ent., **29**, p. 195. February, 1936.

M. P. Zappe

Notes on a Japanese Weevil, *Calomycterus setarius* Roelofs, in Connecticut. Jour. Econ. Ent., **29**, p. 193. February, 1936.

R. C. Botsford

Progress of Mosquito Control in Connecticut, 1935. Proc. 23rd Annual Meeting. N. J. Mosquito Extermin. Assoc., p. 151. (Issued July, 1936).

G. H. Plumb

New Apparatus for Inflating Larvae. No. ET–75, Bur. Ent. & Pl. Quar., U. S. D. A. (mimeographed), 3 pp., 5 figs. February, 1936. (50 separates).

Some Insects Infesting Conifers in Connecticut. Special Bulletin (mimeographed), 19 pp. June, 1936.

B. J. Kaston

The Morphology of the Elm Bark Beetle, *Hylurgopinus rufipes* Eichhoff. Bul. **387**, 42 pp., 14 figs. September, 1936.

The Slit-Sense Organs of Spiders. Jour. Morphology, **58**, p. 189, 19 pp., 23 figs., 1 pl. September, 1935.

The Senses Involved in the Courtship of Some Vagabond Spiders. Ent. Amer., XVI (new series), **97**, 70 pp., 4 pls. August, 1936.

D. S. Lacroix

Insect Pests of Growing Tobacco in Connecticut. Bul. **379**, 46 pp., 44 figs. December, 1935. (Issued March, 1936).

Tobacco Insects in 1935. In Rpt. Tobacco Substation for 1935. Bul. **386**, p. 587, 5 pp., 3 figs. July, 1936.

M. F. Morgan, E. M. Stoddard and R. B. Friend

Lawn Management. Cir. **113**, 10 pp. April, 1936. (Pest Control, 2 pp. by Friend).

SUMMARY OF OFFICE AND INSPECTION WORK

Insects received for identification	744
Nurseries inspected	394
Regular nursery certificates granted (380 nurseries)	387
Duplicate nursery certificates for filing in other states	175

Miscellaneous certificates and special permits granted	179
Nursery dealers' permits issued	106
Shippers' permits issued to nurserymen in other states	214
Blister rust control area permits issued	161
Certification and inspection of occasional shipments	
Parcels of nursery stock	1,357
Corn borer certificates	1,214
Packages of shelled corn and other seeds	1,026
Japanese beetle certificates	
(nursery and floral stock and farm products)	48,787
(soil, sand and manure)	381
Orchards, gardens, fields and lawns examined	130
Buildings examined for termites[1]	627
Shipments of imported nursery stock inspected	13
Number of cases	72
Number of plants	527,950
Apiaries inspected	1,438
Colonies inspected	9,278
Apiaries infested with American foul brood	89
Colonies infested with American foul brood	176
Apiaries infested with European foul brood	1
Colonies infested with European foul brood	1
Apiaries infested with sacbrood	4
Colonies infested with sacbrood	7
Towns covered by gypsy moth scouts	115
Infestations discovered	393
Egg-clusters creosoted	358,171
Larvae and pupae killed by hand	2,765,184
Infestations sprayed	52
Lead arsenate used (pounds)	133,505
Miles of roadside scouted	4,016
Acres of woodland scouted	781,574
Letters written[2]	4,299
Circular letters issued	1,069
Bulletins and circulars mailed	6,787
Packages sent by mail and express	177
Post cards mailed	73
Lectures, papers and addresses at meetings	59

ILLUSTRATIONS

The illustrations used as figures in this bulletin are from the following sources: Figures 44-49 and 52-54 from drawings by Elizabeth H. Kaston; Figures 58 and 69 from drawings by Philip Garman; Figures 60 and 61 from drawings by Raimon L. Beard; Figure 70 from photograph by W. E. Britton; all others from photographs by B. H. Walden.

---

[1] Includes 462 buildings of State Institutions.
[2] Includes 271 written from the Japanese beetle office, and 106 from the gypsy moth office at Danielson.

INDEX

Abbot sphinx, 296
Acucephala albifrons, 304
Adelges abietis, 297, 314
(*Gillettea*) *cooleyi*, 297, 314
Agonopteryx robiniella, 297
Agrilus communis rubicola, 294, 303
Agromyza schineri, 297
Alaus oculatus, 309
Alsophila pometaria, 293, 294, 297, 406, 407
Alypia octomaculata, 303
Amara sp., 309
Amblyteles scitulus, 360
velox, 360
American cockroach, 306
foul brood, 324, 325
Anasa armigera, 387–390
repetita, 387, 390
tristis, 296, 387–390
Anatis quindecimpunctata, 308
Andricus seminator, 297
singularis, 297
Anisopus alternatus, 306
Anobium punctatum, 405
Anomala orientalis, 307
Anthrenus scrophulariae, 306
verbasci, 306
Anuraphis roseus, 293, 294
Anyphaenella saltabunda, 308
Anystis agilis, 308
Apanteles melanoscelus, 363
Apateticus sp., 309
Aphis maidis, 296
pomi, 294
rumicis, 385–387
Aphodius fimetarius, 308
Aphrophora parallela, 298
Apion rostrum, 304
Apple maggot, 295, 378, 379
scab, 364–366, 372, 373
sprays, tests of, 364–366
-tree borer, 355
Araneus trifolium, 308
Arborvitae leaf miner, 298
Argyresthia thuiella, 298
Arotes decorus, 360
Ascia rapae, 296
Ash timber beetle, 300
Asiatic beetle, 307
garden beetle, 308
Asparagus beetle, 296
Aspidiotus perniciosus, 294
Atanycolus simplex, 355
ulmicola, 354–358
Attagenus piceus, 306
Aulacaspis pentagona, 303
Autographa brassicae, 296
Automeris io, 309
Autoserica castanea, 308
Aylax taraxaci, 296
sp., 309
Azalea scale, 303

Bacillus tracheiphilus, 391
Barberry webworm, 303
Bassus diversus, 378
Beaked willow gall, 301
Benacus griseus, 309
Birch leaf mining sawfly, 299
Bird mite, 406, 407
Black carpet beetle, 306
long-sting, 309
vine weevil, 303
Blattella germanica, 306
Blissus hirtus, 308
Blister beetle, black, 304
margined, 303
Say's, 305, 399
Bordeaux mixture, 371, 375, 381
Brachyrhinus ovatus, 367, 368
sulcatus, 303
Bride underwing, 298
Broad-horned prionus, 301
Brown spider beetle, 306
-tail moth, 339, 363
Bryobia praetiosa, 306

Cabbage looper, 296
maggot, 296
worm, 296
Cacoecia argyrospila, 294
cerasivorana, 298
rosaceana, 294
rosana, 303
Calcium arsenate, 379, 391, 392
Calliphora erythrocephala, 306
vomitoria, 306
Calomycterus setarius, 293, 304, 367–370
Calosoma scrutator, 309
sycophanta, 363
Camponotus herculeanus ligniperda noveboracensis, 307
herculeanus pennsylvanicus, 294, 298, 307
Canker worm, 381
fall, 293, 294, 297, 406, 407
spring, 293, 295, 301, 405, 407, 408
Capitonius saperdae, 355, 356, 358
Carpenter ant, black, 294, 298, 307, 392
bee, 307, 392
worm, 301
Carpet beetle, 306
Carpocapsa pomonella, 294
Carrot beetle, 295
Caterpillar hunter, 309
Catocala neogama, 298
Catogenus rufus, 298
Cattle grub, 308
Cecidomyia piniriqidae, 298
poculum, 298
viticola, 294
Cecropia moth, 301
Cedar rust, 365
Cenocoelius populator, 355
Ceratomegilla fuscilabris, 309

Ceutorhynchus marginatus, 296
Chain-spotted geometer, 303
Chalcoides (*Crepidodera*) *helxines*, 293, 294, 400
Chauliodes sp., 310
Chauliognathus pennsylvanicus, 304
Cherry ugly-nest, 298
Chinese praying mantid, 309
Chionaspis euonymi, 303
pinifoliae, 298, 303
Chrysanthemum gall midge, 304
Chrysobothris femorata, 358
sexsignata, 358
sp., 359
Chrysochus auratus, 310
Cicada killer, 308
Cimbex americana, 298
Cingilia catenaria, 303
Citrus mealybug, 305
Clastoptera sp., 303
Clavate tortoise beetle, 296
Clover mite, 306
Cluster fly, 307
Coccinella novemnotata, 309
transversoguttata, 309
Coccus hesperidum, 304
sp., 303
Codling moth, 294, 365, 366
Coleophora laricella, 298
Colorado potato beetle, 297
Common house fly, 306
Compsilura concinnata, 363
Conotrachelus juglandis, 298
nenuphar, 294
Conwentzia hageni, 309
Corn ear worm, 296
leaf aphid, 296
Corydalis cornuta, 310
Corythucha arcuata, 298
ciliata, 298
ulmi, 298
Cottony maple scale, 302
Crab louse, 308
Crabro wasps, 392
Cresylic acid, 375, 376, 380, 382, 383
Crinkled flannel moth, 310
Crioceris asparagi, 296
Cryolite, 379, 382, 383
Cryptorhynchus lapathi, 359
Cryptus vinctus, 360
Ctenocephalus canis, 308
Curculio, 365, 366, 382
Currant aphid, 295
Cutworms, 296, 309
Cyclamen mite, 305
Cyllene caryae, 298
pictus, 359
robiniae, 298
Cynomyia cadaverina, 306

Datana integerrima, 298
ministra, 294
Deloyala clavata, 296
Dendroleon obsoletum, 310
Depressaria pulvipennella, 298
Dermestes cadaverinus, 305
lardarius, 305
Derris, 341, 371, 373, 374, 379, 382, 391, 392
Diabrotica duodecimpunctata, 304
vittata, 296, 391
Diacrisia latipennis, 310
Diarthronomyia hypogaea, 304
Diaspis carueli, 298
Dibrachys hemerocampae, 363
scutellata, 309
sp., 359
Dicerca lurida, 357, 360
Dichomeris marginellus, 298, 303
Dilachnus strobi, 298
Dioctes molestae, 378
Diplotaxis atlantis, 294, 295, 403
Diprion polytomum, 298
Dobson fly, 310
Dog flea, 308
Dogwood club gall, 300
Drepanaphis acerifoliae, 298
Drugstore beetle, 306, 307

Ecdytolopha insiticiana, 299
Eight-spotted forester, 303
Elm bark beetle, 351
borer, 302, 354
lacebug, 298
leaf beetle, 299, 401
sawfly, 298
spanworm, 299
Emphytus cinctus, 323
Empoasca fabae, 296, 304, 370, 371
Empria ignota, 294
Ennomos subsignarius, 299
Ephestia kuehniella, 305
Ephialtes pedalis, 363
Epicauta marginata, 303
pennsylvanica, 304
Epilachna varivestis (*corrupta*), 296
Epitrix cucumeris, 296
Erannis tiliaria, 299, 405
Eriococcus azaleae, 303
Eriophyes eucricotes, 303
tiliae, 299
Eriosoma americana, 299
Erythraspides pygmaea, 294
Estigmene acraea, 310
Eubadizon magdali, 359
Euceraphis mucida, 299
Eucosma gloriola, 299
Eugenol, 347
Eulia juglandana, 299, 399
Euonymus scale, 303
Euphoria fulgida, 304
European corn borer, 293, 297, 345, 346
control, 340–345
elm bark beetle, small, 302
elm scale, 299
foul brood, 324
fruit scale, 295, 300
pine shoot moth, 302, 314

red mite, 293, 295, 366, 372–377, 383
spruce sawfly, 298
Eurycyttarus confederata, 406
Euschistus ictericus, 304
Euthochtha galeator, 310
Eyed click beetle, 309

Fall webworm, 294, 300, 399
Fenusa pumila, 299
Fish oil, 363, 366, 372, 373, 383
Flotation sulfur, 365, 372, 374, 376, 377, 382
Formica exsectoides, 308
sp., 306
Four-lined plant bug, 303, 305
Frontina frenchii, 363
Fruit tree leaf roller, 294
Fucellia maritima, 306
Fumea casta, 310, 406
Furniture beetle, 405

Galerucella nymphaeae, 304
xanthomelaena, 299, 401
Garden millipede, 297, 304
Gaurotes cyanipennis, 295
Geraniol, 347
German cockroach, 306
Giant garden slug, 304
Gladiolus thrips, 305
Glover's scale, 304
Glycobius speciosus, 299
Golden tortoise beetle, 310
Gordian sphinx, 310
Gossyparia spuria, 299
Gouty pitch pine midge, 302
Granary weevil, 306
Grape plume moth, 295
sawfly, 294
tube gall, 294
Graphocephala coccinea, 304
Grapholitha molesta, 295
Graptolitha sp., 299
Green apple aphid, 294
gold beetle, 310
strawberry slug, 294
Greenhouse leaf tier, 305, 399
Gryllotalpa hexadactyla, 310
Gypsy moth, 301, 309, 363
control, 330-339

Hag moth, 295
Hairy chinch bug, 308
Halisidota caryae, 299
Hamadryas antiopa, 299
Harmologa fumiferana, 299
Helconidea ligator, 360
Heliothis obsoleta, 296
Hellgramite, 310
Hemerocampa leucostigma, 299
Hemichroa americana, 299, 302, 403
Hemimene albolineana, 299
Hemispherical scale, 305
Heterospilus cephi, 355
sp., 353, 354, 356–358
Hickory bark beetle, 302
borer, 298
leaf roller, 399
leaf-stem gall aphid, 301
tussock moth, 299
Hippodamia convergens, 309
Hormaphis hamamelidis, 303
Hormomyia canadensis, 303
Horned squash bug, 387-390
House centipede, 307
Hydrated lime, 364–366
Hylemyia brassicae, 296
Hylobius pales, 299
radicis, 293, 300, 410, 411
Hylurgopinus rufipes, 300, 351–355
Hyperaspis signata, 309
Hypermallus villosus, 300
Hyphantria cunea, 294, 300, 399
Hypoderma bovis, 308
lineata, 308
Hyposoter (Campoplex) fugitivus, 309
Hyptia harpyoides, 360

Ichneumon irritator, 359, 360
Illinoia solanifolii, 293, 296
Imported ground beetle, 363
willow leaf beetle, 301
Indian-meal moth, 305
Inspection of apiaries, 324-330
imported nursery stock, 322
nurseries, 314–323
Io moth, 309
Isadelphus sp., 360
Ithycerus noveboracensis, 293, 295, 400
Itoplectis conquisitor, 363

Japanese beetle, 293, 295, 303, 305, 346–351
general survey, 349
grub digging, 349
inspection and certification, 348
scouting, 346
trapping, 347
Julus hortensis, 297, 304
venustus, 306
June berry lipped gall, 303
Juniper scale, 298
webworm, 298, 303

Lachnus sp., 303
Ladybeetle, convergent, 309
spotted, 309
five-spotted, 309
nine-spotted, 309
15-spotted, 308
Lagoa crispata, 310
Larch case bearer, 298
Larder beetle, 305
Large twig aphid, 300
Lasioptera clavula, 300
vitis, 295
Lasius niger americana, 308
niger neoniger, 308
sp., 306, 308, 393

Lead arsenate, 351, 363–366, 372, 373, 376, 377, 379, 382, 383, 400, 402, 404–406, 409
Lecanium corni, 295, 300
Lema trilineata, 297
Leperisinus aculeatus, 300
Lepidosaphes gloveri, 304
ulmi, 295, 300, 303, 304
Leptinotarsa decemlineata, 297
Lesser prionus, 301
Light-loving grapevine beetle, 308
Ligyrus gibbosus, 295
Limax maximus, 304
Lime, 372, 373, 376, 377, 379, 382
sulfur, 365, 372–377, 379–381, 406
-tree looper, 299, 405
Liopus variegatus, 359
Liponyssus sylviarum, 308, 406, 407
Lithocolletis hamadryadella, 300
Locust borer, 298
twig gall, 299
Longistigma caryae, 300
Luna moth, 310
Lunate long-sting, 309
Lycophotia margaritosa saucia, 304
Lyctus sp., 307
Lygus pratensis, 305
sp., 295

Macrobasis torsa, 293, 303, 403
Macrocentrus ancylivorus, 378
Macrodactylus subspinosus, 300, 303, 305, 308, 399
Magdalis armicollis, 351, 358, 359
barbita, 351, 358, 359
olyra, 359
sp., 300
Magnolia scale, 300
Malachius aeneus, 309
Malacosoma americana, 293, 295, 300, 409
disstria, 293, 300, 401, 402
Maple bladder gall, 301
borer, 299
leaf-stem borer, 301
spindle gall, 301
Mediterranean flour moth, 305
Megarhyssa atrata, 309, 359
lunator, 309, 359
Menecles insertus, 300
Meniscus mirabilis, 360
Melapelma spectabilis, 360
Metriona bicolor, 310
Mexican bean beetle, 296, 309
Microplitis kewleyi, 309
Mosquito control work, 396–399
Mound-building ant, 308
Mud-dauber wasp, 309
Mulberry whitefly, 302
Musca domestica, 306
Muscina pascuorum, 306
stabulans, 306
Museum beetle, 306
Myrmica sp., 306
Myzus ribis, 295

Native elm bark beetle, 300
Neoclytus acuminatus, 355, 357
Neolecanium cornuparvum, 300
Neotetranychus buxi, 303, 402
Neuroterus floccosus, 300
New York weevil, 293, 295, 400, 401
Nicotine alkaloid, 385–387
hydrochloride, 385, 386
naphthenate, 385–387
salicylate, 385–387
sulfate, 371, 375, 376, 380, 381, 385–387
tannate, 341
Nodonota puncticollis, 295
Northern mole cricket, 310
Nygmia phaeorrhoea, 339

Oak blotch leaf miner, 300
flake gall, 300
lacebug, 298
mite, 301
spangles, 298
Oberea bimaculata, 295
Oblique-banded leaf roller, 294
Ochrosidia villosa, 294, 308
Oecanthus pini, 300
Olethreutes abietana, 301
Omphalocera dentosa, 303
Onion thrips, 297
Oriental fruit moth, 295, 378, 382
Orthosoma brunneum, 301
Oryzaephilus surinamensis, 305
Oxyptilus periscelidactylus, 295
Oyster-shell scale, 295, 300, 303, 304, 314

Pachystethus lucicola, 308
Paleacrita vernata, 293, 295, 301, 407
Pales weevil, 299, 410, 411
Papaipema nitela, 297, 305
Paralechia pinifoliella, 301
Parandra borer, 301
Parandra brunnea, 301
Paratetranychus bicolor, 301
pilosus, 293, 295
ununguis, 301
Parcoblatta virginica, 310
Paria canellus var. *quadrinotatus*, 305
Peach tree borer, 360
Pear psylla, 295
Pegomyia hyoscyami, 297
Pelidnota punctata, 295
Pepper maggot, 293, 297, 399
Periplaneta americana, 306
Perisierola angulata, 378
Phaeogenes haeussleri, 378
Phanaeus carnifex, 310
Phenacoccus acericola, 301
Phlyctaenia rubigalis, 305, 399
Phobetron pithecium, 295
Phorocera claripennis, 363
Phthirius pubis, 308
Phygadeuon sp., 360
Phyllaphis fagi, 301

Phyllocoptes aceris-crumena, 301
quadripes, 301
Phyllophaga gracilis, 310
sp., 295, 308
Phylloxera caryaecaulis, 301
Phymatodes variabilis, 307
Phytophaga rigidae, 301
Pigeon horntail, 359
Pine bark aphid, 301
blister rust, 314
cone gall, 302
leaf scale, 298, 303, 314
needle gall, 298
spittle bug, 298
tree cricket, 300
Pineus strobi, 301
Pissodes approximatus, 301
strobi, 301
Plagiodera versicolora, 301
Platysamia cecropia, 301
Plodia interpunctella, 305
Plum curculio, 294
Podops cinctipes, 310
Poecilocapsus lineatus, 303, 305
Pollenia rudis, 307
Polydesmus moniliaris, 305
Pomphopoea sayi, 305, 399
Popillia japonica, 293, 295, 303, 305
Poplar canker, 314
sawfly, 302, 400
twig gall fly, 297
Porcellia scaber, 307
Porthetria dispar, 301
Potato aphid, 293, 296
flea beetle, 296
leafhopper, 296, 304, 370, 371
Powder-post beetle, 307, 392, 393, 404
Prionoxystus robiniae, 301
Prionus laticollis, 301
Priophorus acericaulis, 301
Prociphilus tessellatus, 302
Pseudocneorrhinus setosus, 304
Pseudococcus citri, 305
sp., 304
Psocus venosus, 310
Psyllia pyricola, 295
Ptinus brunneus, 306
Pulvinaria vitis, 302
Pyrausta nubilalis, 293, 297

Raspberry cane borer, 295
Recurvaria apicitripunctella, 302
Red-humped caterpillar, 302, 309
shouldered twig borer, 302
spider, 297, 304, 305
Reticulitermes flavipes, 294, 302, 305, 307, 308
Retinodiplosis inopis, 302
Rhabdophaga brassicoides, 302
strobiloides, 302
Rhagium lineatum, 302
Rhagoletis pomonella, 295
Rhaphitelus maculatus, 359
Rhododendron lacebug, 304
Rhyacionia buoliana, 302
Rhysella nitida, 359
Rhytidoloma saucia, 310
Ribbed pine borer, 302
Rose chafer, 300, 303, 305, 308, 399
leaf beetle, 295
stem girdler, 294, 303
Rosy apple aphid, 293, 294, 383, 384
Rotenone, 371, 379, 382, 391, 392
Round-headed apple tree borer, 302
Rustic borer, 302

Sacbrood, 325
Saissetia hemisphaerica, 305
Salt marsh caterpillar, 310
San José scale, 294, 314
Saperda candida, 302, 355
discoidea, 357
tridentata, 302, 353–357
Satin moth, 302, 361–364, 400
artificial control, 363
description, 362
food plants, 363
life history and habits, 361
natural enemies, 363
quarantine revoked, 363
Saw-toothed grain beetle, 305
Schizura concinna, 302
Scolytus multistriatus, 302
quadrispinosus, 302
sulcatus, 296
Scopelosoma morrisoni, 310
tristigmata, 310
walkeri, 310
Scutigera forceps, 307
Seioptera vibrans, 307
Seius pomi, 372, 375
Serica sp., 310
Shamrock spider, 308
Silverfish, 307
Sisyrosea textula, 310
Sitka spruce gall aphid, 297
Sitodrepa panicea, 306, 307
Sitophilus granaria, 306
Small oak apple, 297
Soft scale, 304
Soldier beetle, 304
Sooty blotch, 366
Spathius canadensis, 351–353
Sphecius speciosus, 308
Sphecodina abbotii, 296
Sphinx gordius, 310
Spinach leaf miner, 297
Spiny elm caterpillar, 299
Spittle bug, 305
Spotted grapevine beetle, 295
Spruce budworm, 299
gall aphid, 297, 314
mite, 301
Squash bug, 296, 387–390
Stable fly, 306
Stalk borer, 297, 305
Stenosphenus notatus, 302
Stephanitis rhododendri, 304

Stilpnotia salicis, 302, 361
Strawberry crown girdler, 367
whitefly, 296
Striped cucumber beetle, 296, 391, 392
Sturmia scutellata, 363
Sulfur, 364–366, 372, 373, 375–377, 382
Sycamore lacebug, 298
Synanthedon exitiosa, 360
Syntomosphyrum orgyrae, 309

Tachina mella, 363
Taeniothrips simplex (*gladioli*), 305
Tarnished plant bug, 305
Tarsonemus pallidus, 305
Telenomus californicus, 363
Tenebroides corticalis, 306
Tenodera sinensis, 309
Tent caterpillar, eastern, 293, 295, 300, 379–381, 409
forest, 293, 300, 401, 402, 405
Tetraleurodes mori, 302
Tetralopha robustella, 302
Tetranychus bimaculatus, 297, 304, 305
Termite, eastern subterranean, 294, 302, 305, 307, 308, 392–396
effectiveness of metal shields, 394
observation on soil treatments, 395
survey of damage to buildings, 393
Theronia fulvescens, 363
Three-lined potato beetle, 297
Thrips tabaci, 297
Thysanocnemis fraxini, 302
Tibicen sp., 310
Tineola biselliella, 307
Tomato grapevine gall, 295
Tomoxia bidentata, 360
Toumeyella liriodendri, 302
Tremex columba, 359
Trialeurodes packardi, 296
Trichiocampus viminalis, 302, 400
Trichionotus affinis, 304
Trichogramma, 340, 343, 344, 378
Trigonoderus algonquinia, 359
Trigonura hicoriae, 357, 358
Triphleps insidiosus, 305
Troctes pulsatorius, 307
Tropaea luna, 310
Tulip tree scale, 302, 309
Twelve-spotted cucumber beetle, 304
Twig pruner, 300
Typhaea fumata, 306
Typhlocyba pomaria, 296

Upis ceramboides, 302
Urographis fasciata, 359

Variegated cutworm, 304

Walnut caterpillar, 298
weevil, 298
Webbing clothes moth, 307
White apple leafhopper, 296
-marked tussock moth, 299
peach scale, 303
pine tip moth, 299
pine weevil, 301, 314
Willow cabbage gall, 302
flea beetle, 400
Wilt disease, 391, 410
Winthemia quadripustulata, 363
Wireworms, 297
Witch-hazel cone gall, 303
Wood borer, 355, 392
wasp, 359
Wool sower, 297
Woolly alder aphid, 302
beech aphid, 301
elm aphid, 299
maple leaf scale, 301

Xiphydria maculata, 359
Xorides albopictus, 356–358
Xylobiops basillare, 302
Xylocopa virginica, 307, 392
Xylotrechus colonus, 302, 355, 360

Yellow-necked caterpillar, 294

Zenillia blanda, 363
Zonosemata (*Spilographa*) *electa*, 293, 297, 399